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Energy-Efficiency Testing Activities of the Mobile Energy Laboratory

Semiannual Report:
October 1, 1989, Through March 31, 1990

G. B. Parker

January 1991

Prepared for the U.S. Department of Energy
Federal Energy Management Program
under Contract DE-AC06-76RLO 1830

Pacific Northwest Laboratory
Operated for the U.S. Department of Energy
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Sponsor: U.S. Department of Energy Federal Energy Management Program
Period: October 1, 1989, through March 31, 1990
Contractor: Pacific Northwest Laboratory, P.O. Box 999, Richland, Washington
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1.0 EXECUTIVE SUMMARY

This report summarizes energy-efficiency testing activities during the first and second quarters of fiscal year 1990 applying the Mobile Energy Laboratory (MEL) testing capabilities. Four MELs, developed by the U.S. Department of Energy (DOE) Federal Energy Management Program (FEMP), are administered by Pacific Northwest Laboratory (PNL[1]) for energy testing and program support functions at federal facilities. The using agencies principally fund MEL applications, while DOE/FEMP funds program administration and capability enhancement activities.

This report fulfills the requirements established in the MEL Use Plan (PNL-6861) for semiannual reporting on energy-efficiency testing activities using the MEL capabilities. The MEL Use Committee, formally established in 1989, developed the MEL Use Plan and meets semiannually to establish priorities for energy-efficient testing applications using the MEL capabilities. The MEL Use Committee is composed of one representative each of the U.S. Department of Energy, U.S. Army, U.S. Air Force, U.S. Navy, and other federal agencies.

1.1 Management Activities

Revisions to the MEL Use Plan and Committee Charter were developed and distributed to the MEL Use Committee members on December 19, 1990. After approval is received from all members, the revisions will be incorporated into a complete update to the document to be distributed prior to the next Committee meeting.

The U.S. Air Force Engineering and Services Center (AFESC) continued to explore options to transfer MEL responsibilities to a Major Command and thereby secure funding support. The Air Force Logistics Command has expressed interest, and FEMP and PNL initiated communications to follow up. The Naval

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Energy and Environmental Support Activity (NEESA), representing the U.S. Navy on the MEL Use Committee, is reorganizing its MEL support activity, but will continue to act as the Navy representative.

During the reporting period, the day-to-day management and coordination activities for MEL testing at Army installations were transferred from Mr. James C. Vasiloff of Army Forces Command (FORSCOM) to the Savannah District of the Corps of Engineers (SAS). The role of SAS in the project and the process for MEL testing at the installations are defined in Chapter 13 of the FORCES Command Energy Program Guide, FORSCOM Pamphlet 11-27 (see Attachment 1).

1.2 Site Activities

During the reporting period, initial site visits were conducted at five FORSCOM installations: Fort Irwin, Hunter Army Air Field, Fort Stewart, Fort McPherson, and Fort Gillem. Based upon these site visits, twelve MEL Assignment Plans (MAPs) describing the tests to be conducted were developed by PNL and approved by FORSCOM.

Eight tests were completed and seven tests were initiated at seven FORSCOM installations: Fort Carson, Fort Lewis, Fort Irwin, Fort Stewart, Hunter Army Air Field, Fort McPherson, and Fort Gillem.

Other PNL testing using MEL equipment was conducted at the National Naval Medical Center, DOE Hanford Site, Fermi National Accelerator Laboratory, and Lawrence Berkeley Laboratory. PNL entered into a contract with the Department of Transportation, Maritime Administration to conduct energy use testing at the U.S. Merchant Marine Academy. This testing will entail steam plant efficiency testing, end-use electrical measurements, and development of energy use baselines. In addition, plans for testing were developed for the DOE Headquarters building.

1.3 Significant Test Findings

Significant findings from the testing activity during the reporting period are as follows:

- The lighting consumption data for Building 8030 at Fort Carson show a long-term energy savings estimate of approximately $2700/year in combined energy and demand reduction due to exterior delamping and interior lighting awareness programs conducted by the installation. Basewide potential for savings resulting from similar programs in nonresidential structures could approach ~$300,000/year.

- The metered electrical consumption data for a new air compressor installed in Building 8000 at Fort Carson show significant demand and usage reduction resulting in estimated savings of over $2800/year.

- Lighting levels measurements of typical new and old office buildings at Fort Irwin show a potential energy savings of over $200,000/year

if all existing building were delamped and/or were retrofitted with energy-efficient lighting, and if planned acquisition of buildings were designed to the Corps of Engineers criteria for lighting levels.

- The combustion efficiency testing of 10 small boilers at Fort McPherson shows efficiencies ranging from 71% to 83%. All boilers were receiving sufficient combustion air. However, those with less than 75% efficiency are recommended for maintenance.

1.4 Documentation and Reporting

Twelve MEL test procedures are in various stages of development by PNL. Three procedures were completed and have become Appendices to the MEL Use Plan; five procedures were reviewed by the Corps of Engineers Laboratories and will be revised; one procedure is under review by the Corps, one procedure is in standards committee review, and three are currently undergoing first draft. An additional eight procedure titles have been identified.

Two test reports for FORSCOM testing were drafted during the reporting period in an agreed-upon standard format. These are Test Report IRWIN-003-90/02/09 Measured Lighting Levels in Modular Office Buildings (for Fort Irwin) and FTSAMH-001-90/02/12 Air Conditioner Controller Evaluation (for Fort Sam Houston).

Project plans for central boiler plant testing at the Merchant Marine Academy and for metering lighting at the DOE Headquarters building were approved by representatives at the organizations.

A brochure describing the MEL capabilities and organization was developed and distributed to the MEL Use Committee members (see Attachment 2).

1.5 Equipment

Equipment on-board the DOE MEL was inventoried and calibrated and moved from Fermi National Accelerator Laboratory in Chicago, Illinois, to the National Naval Medical Center in Bethesda, Maryland. Additional testing equipment was acquired by NEESA with FEMP funding, and two firms have been qualified by PNL to conduct equipment calibrations. A contract was negotiated with a professional bus driver to provide for transport of the MELs.

An agreement was reached with FEMP for new equipment purchases to be made by NEESA and PNL to support MEL testing. In addition, PNL is establishing a metering laboratory in Richland, Washington, to better support MEL activities.

2.0 PROGRAM DESCRIPTION

The U.S. Department of Energy (DOE) Federal Energy Management Program (FEMP) provides leadership and assistance to federal agencies on energy management issues. Since much of the federal infrastructure is old and was built when energy was of relatively low value and cost, it now presents tremendous challenges and opportunities for energy-efficiency improvement. FEMP has developed this unique program of technical support and guidance to assist federal agencies in identifying and implementing cost-effective energy-saving projects.

2.1 Scope

Mobile Energy Laboratories (MELs) are equipped by FEMP for the on-site evaluation of energy use efficiency. Traceable energy use metering and analysis equipment is provided to test the efficiency of energy conversion and distribution systems, as well as the various end-use applications. Specific test procedures are being developed for common investigations. Trained engineers and specialists conduct tests with the assistance of host facility staff and contractors.

Reports are produced to describe the testing, test results, and suggested courses of action. These reports can be used to justify changes in operating procedures, maintenance efforts, system designs, or energy-using equipment. The MEL capabilities are also instrumental in the development of integrated resource plans for federal facilities and can be used to assess the results of energy conservation and load management projects.

2.2 Organization

Four MELs have been configured for use on federal facilities. Although the MELs are the property of DOE, a MEL is assigned to each of the following federal agencies: 1) Department of the Army, 2) Department of the Navy, 3) Department of the Air Force, and 4) U.S. Department of Energy. The MEL Use Plan (PNL-6861) recognizes the need for and advantages of centralized administration, test procedure development, and operator training. DOE assigns new equipment and upgrades existing equipment as new capabilities are developed. The equipment, engineers, and specialists are made available to federal agencies that provide funding for the direct costs associated with MEL use.

Pacific Northwest Laboratory (PNL) is responsible for MEL maintenance, equipment calibration, test procedure development, testing, and overall management and reporting requirements. PNL works with the MEL Use Committee to coordinate assignments of all MELs with federal agencies that provide funding support for MEL use.

MEL assignments are made only after appropriate contracts and a MEL Assignment Plan (MAP) are approved. The contract may be a memorandum purchase order or similar document to the DOE/FEMP. The MAP indicates the tests to be conducted, the estimated duration of the tests, and the specific logistical and site support requirements for each MAP.

3.0 MANAGEMENT ACTIVITIES

In 1988 the DOE assigned PNL responsibility for MEL administration and management to better coordinate and enhance MEL applications. Four MELs were originally configured in 1985 by the Naval Energy and Environmental Support Activity (NEESA) for DOE and delivered to the agencies identified above for application. Three of the MELs are now managed by PNL for use by any federal agency, with NEESA managing the fourth MEL for Navy activities.

3.1 MEL Use Committee

A MEL Use Committee (Committee) was formally established in 1989 with the approval of the MEL Use Plan by representatives of the U.S. Department of Energy, U.S. Army, U.S. Air Force, and U.S. Navy. A charter for this committee was approved at the semiannual meeting held in Atlanta, Georgia, on October 31 and November 1, 1989. The minutes from this meeting are provided in Attachment 3.

The most significant activities pertain to updates to the MEL Use Plan and Committee charter, the development of MEL brochures, coordination with NEESA and resolution of equipment procurement issues, and efforts to facilitate more active U.S. Air Force participation. Progress made during the reporting period in each of these areas is described in appropriate sections of this report.

3.2 MEL Program Oversight

Revisions to the MEL Use Plan and Committee charter were developed and distributed to the MEL Use Committee members on December 19, 1990. After approval is received from all members, the revisions will be incorporated into a complete update to the document to be distributed prior to the next Committee meeting. Additional revisions will also be proposed as necessary based upon MEL applications experiences.

Preparations for the Spring 1990 MEL Use Committee meeting were made for April 30 and May 1, 1990, in San Diego, California.

3.3 Forces Command Project Management

The day-to-day management activities of the project were transferred by Jim Vasiloff of FORSCOM to the SAS in November 1989. Mr. Vasiloff retains overall management responsibilities and authority for funding overall FORSCOM testing activities. PNL management held numerous telephone discussions with SAS and met with SAS in Atlanta in March to define the role of SAS in FORSCOM and Department of the Army (DA) MEL testing activities. The role of SAS in the project and the process for MEL testing at the installations are defined in Chapter 13 of the Forces Command Energy Program Guide, FORSCOM Pamphlet 11-27 (see Attachment 1).

It was agreed that SAS would coordinate comments from the Corps of Engineers Laboratorys and the Engineering Housing and Support Center on the

draft test procedures and act as the coordinator for requests from FORSCOM installations for MEL testing. Coordination of testing requests also includes integrating the Corps of Engineers testing activities with that of the MEL to avoid duplication. In addition, SAS will approve all recommended tests identified by PNL during the initial site visit, provide comments on PNL-prepared draft test reports, and distribute the final test reports to the installations.

A project review meeting with Jim Vasiloff was held in Richland, Washington, on February 13 through 15, 1990. Discussion centered on schedule of the testing activities and expanding the scope of work to other MACOMs, as well as opportunities for integrating testing activities with energy conservation programs and incentives offered by the utilities serving the installations.

Graham Parker, Project Manager, and Rich Szydlowski, Technical Coordinator, attended the MEL Use Committee meetings in Atlanta on October 31 through November 1, and in San Diego on March 29 through 30. The status of MEL testing and procedure-writing activities was presented, and key testing results were summarized. In addition, discussions were held concerning the Committee's position on equipment usage among the participating agencies and new equipment purchases.

3.4 Other Department of Defense and Federal Agencies Activities

The U.S. Air Force Engineering and Services Center (AFESC) continued to explore options to transfer MEL responsibilities to a Major Command and thereby secure funding support. The Air Force Logistics Command has expressed interest, and FEMP and PNL initiated communications to follow up. It was anticipated that the command would send a representative to the Spring 1990 MEL Use Committee meeting.

NEESA is reorganizing its MEL support activity. Paul Delaney was replaced temporarily by Steve Coray, and now Jim Heller has taken on the responsibility for U.S. Navy MEL operations. Rich Messock, who was the original Navy MEL representative, will continue to track MEL applications to ensure that the necessary support is provided. NEESA continued to receive FEMP funding for equipment support and upgrades for all the MELs.

MEL applications for other federal agencies are monitored by Bill Riches of Fermi National Accelerator Laboratory. Mr. Riches attends the MEL Committee Meetings representing other federal agencies.

PNL entered into a contract with the Department of Transportation, Maritime Administration to conduct energy use testing and support a shared energy savings solicitation at the U.S. Merchant Marine Academy. This testing will entail steam plant efficiency testing, end-use electrical measurements, development of energy use baselines, and assistance with the development of a shared energy-savings project if appropriate.

4.0 TESTING ACTIVITIES AND RESULTS

4.1 FORSCOM Installations

During the reporting period, initial site visits were conducted at five FORSCOM installations. Twelve MEL Assignment Plans (MAPs) describing the tests to be conducted were prepared. Eight tests were completed, and seven tests were initiated at seven installations during the reporting period. See Attachment 4 for the current listing and status of the tests (MAPs) scheduled at FORSCOM sites. The testing activities and significant results are summarized for each installation.

4.1.1 Fort Carson

An initial site visit was conducted at Fort Carson in January 1989. Testing was initiated also in January 1989.

4.1.1.1 Testing Activities

PNL continued to remotely collect the electricity consumption data from Buildings 8030 and 8000 (CARSON-001 and CARSON-003, respectively). The end-use metering equipment for these tests was installed in these buildings in January 1989. Building 8030 underwent an exterior delamping and interior lighting awareness program in March 1989. A new replacement air compressor was installed in Building 8000 in July 1989. (Testing for CARSON-002 was completed in March 1989; the final test report is under preparation.)

4.1.1.2 Test Results

The lighting consumption data for Building 8030 show predicted energy savings for lighting of approximately $2700/year based on combined energy and demand reductions, even though the total building consumption increased slightly during the monitoring period. A similar program involving all nonresidential buildings on the base would yield an estimated savings of approximately $300,000/year.

Metering data from Building 8000 for the new air compressor also show significant demand and usage reduction resulting in predicted savings of over $2800/year.

4.1.1.3 Other Activities

The data for these two buildings were supplied to the energy engineer at Fort Carson. The data from Building 8000 were of immediate interest because the site was contemplating purchase of a new parts washer for this building. The data were useful for making decisions regarding sizing and the most economical fuel choice for the washer.

4.1.2 Fort Lewis

An initial site visit was conducted in May 1989, and testing was initiated in September 1989. Nine MAPs were prepared, and six were approved (see Attachment 4).

4.1.2.1 Testing Activities

During the reporting period, electrical usage data were remotely collected from the three substations serving the site (FTLEWIS-002) and from the commissary (FTLEWIS-005). Data were also collected from the helicopter simulation building (FTLEWIS-009) to ascertain why the building was experiencing periodic power outages. Data were collected for these tests until the end of October. In November, PNL removed the data collection equipment.

The scheduled 1989/1990 winter testing (FTLEWIS-006-R1 and FTLEWIS-007) was delayed until the winter of 1990/1991 because of an early end to the heating season and unavailability of test equipment, primarily saddle valves for steam line taps.

4.1.2.2 Test Results

The data from FTLEWIS-002 and FTLEWIS-005 are being summarized and analyzed for test report preparation. Preliminary findings for FTLEWIS-002 indicate that the concurrent demand from the three substations matches closely the sequential demand for which the site is being billed by the utility. Combining the three substations into a single substation is therefore not cost-effective as a means of reducing the demand charge. Preliminary findings for FTLEWIS-005 show that the commissary electrical energy usage per square foot is significantly less than that of other buildings in the Pacific Northwest region of similar classification.

Data from FTLEWIS-009 did not clearly show why the building was experiencing power outages. Further testing using a subcontractor specializing in disturbance analysis will be necessary to identify the problem. Data are also being summarized for FTLEWIS-003 (sewage treatment plant electric profile).

4.1.2.3 Other Activities

The Bonneville Power Administration (BPA) is seeking to acquire energy-efficient resources in the federal sector in the BPA service territory. BPA has a direct load to federal customers of over 130 MW and an unknown load to federal customers through member public and private utilities. BPA is required to purchase conservation resources in the Pacific Northwest region through cost-effective demand-side programs. Therefore, BPA, in cooperation with Tacoma Public Utilities, has targeted Fort Lewis as a potential candidate for energy conservation programs financed primarily by BPA through the utility.

PNL staff have initiated discussions with BPA, Tacoma Public Utilities, and Fort Lewis to assess potential interest. Fort Lewis has responded positively and is interested in continuing discussions. Testing activities will become a critical part of this activity, to better assess the conservation potential and evaluate programs that are implemented.

4.1.3 Fort Irwin

An initial site visit was conducted at Fort Irwin in September 1989. Testing activities were initiated in December 1989 for three MAPs.

4.1.3.1 Testing Activities

Electrical metering equipment was installed at the substation (IRWIN-001) and in two modular office buildings (IRWIN-002) im mid-December. The substation metering is designed to ascertain the peak demand profile and relative contribution of each major user group at the installation. The modular office building metering is designed to compare performance of new and old office buildings and assess the heating, ventilating, and air conditioning (HVAC) system performance. The data will be remotely collected from PNL through the summer months.

A lighting levels evaluation (IRWIN-003) in new and old modular office buildings was conducted to ascertain potential for reduction in electrical energy usage and demand in the office sector.

4.1.3.2 Test Results

Results of the IRWIN-003 testing (Report No. IRWIN-003-90/02/09) show inefficient fixtures in the older office buildings and "over-lighting" in the new modular office buildings. Recommendations were made to replace old fixtures with energy-efficient fixtures and lamps in the old office buildings, and to delamp the newer office buildings. MEL project staff also recommended modifying the lighting and interior color specifications of future modular office buildings being procured to make them more lighting energy-efficient. Estimated savings for bringing all the office buildings at Fort Irwin to the Corps of Engineers design criteria (or equivalent American Society of Heating, Refrigerating, and Air-Conditioning Engineers [ASHRAE] standard) is $200,000/year with a payback of less than 1 year based on the current electricity rates for Fort Irwin.

4.1.3.3 Other Activities

PNL contacted the representative at the utility servicing Fort Irwin (Southern California Edison) to explore conservation programs being offered by the utility to large federal customers. Information supplied by the utility is currently being reviewed by PNL.

4.1.4 Fort Stewart/Hunter Army Air Field

During the reporting period, an initial site visit was conducted at Fort Stewart and Hunter Army Air Field. Two MAPs were prepared for Fort Stewart: STWRT-001-R1 (electrical distribution system profile) and STWRT-002-R1 (main power plant electrical profile). (Note: The initial MAPs prepared for Fort Stewart were revised [designated as -R in the MAP number] to reflect the unavailability of site electrician help for installation assistance). Two MAPs were also prepared for Hunter Army Air Field: HUNTR-001 (electrical distribution system profile) and HUNTR-002 (chiller performance evaluation).

4.1.4.1 Testing Activities

Electrical usage data logging equipment was installed for STWRT-001-R1, STWRT-002-R1, and HUNTR-001 in February 1990 in preparation for data collection during the summer peak period. Both sites need information on the peak demand as well as the relative contribution of the demand for the various end users. At Fort Stewart, the chiller operation dominates the main power plant consumption. Information is needed to better understand the characteristics and factors driving the peak demand in order to institute demand and load conservation.

Testing for HUNTR-002 will be conducted during a week-long period in the summer of 1990.

4.1.4.2 Test Results

Data are being collected remotely for both tests from Fort Stewart. Because no phone line was available for the data-logging equipment for the test at Hunter, a portable computer will be supplied to Hunter that is programmed to automatically record the data on diskettes that are periodically replaced and returned to PNL by site personnel.

4.1.4.3 Dther Activities

PNL received a request from Fort Stewart for information concerning calibration equipment and MEL capabilities for performing routine calibration at the site. Because the MEL project is not tasked to provide routine calibration services and does not own equipment to perform such calibration, PNL recommended that the site either purchase calibration equipment or request this service through a Corps of Engineers laboratory. Purchase would be less expensive than contracting with a private vendor.

4.1.5 Fort McPherson

An initial site visit was conducted at Fort McPherson during the reporting period. Three MAPs were prepared: FTMAC-001 (combustion and delivery efficiency of two large boilers), FTMAC-002 (electrical use profile of Building 200), and FTMAC-003 (combustion efficiency of small boilers).

4.1.5.1 Testing Activities

Tests for FTMAC-001, FTMAC-002, and FTMAC-003 were initiated in late January. Testing for FTMAC-002 was completed, while equipment was left in place for FTMAC-001 and FTMAC-003. Data will continue to be collected remotely from PNL through the summer to observe the long-term operation of the boilers and the summer peaking period of Building 200.

4.1.5.2 Test Results

The preliminary results for the three tests were provided to site personnel soon after the testing was completed. Data analysis is under way for preparation of the reports.

Preliminary results indicate that the delivery efficiency for the two large boilers (FTMAC-001) was in excess of 75% for both boilers. These boilers therefore do not need to be immediately replaced and can continue to provide efficient operation with continued good maintenance practices. The combustion efficiency testing on 10 small boilers (FTMAC-002) showed efficiencies ranging from 71% to 83%. The rooms containing these boilers all had recent modifications that allowed unobstructed flow of combustion air to the boilers. The effectiveness of this modification was not quantifiable. However, the five boilers with less than 75% efficiency are recommended for maintenance to increase their efficiency to the level of the other boilers.

The metering of Building 200 total electrical consumption (FTMAC-003) is continuing. Data from an 8-day period in February show a peak electric demand of ~2200 kW during the week and ~1800 kW during the weekend, a significant weekend demand for a building of that size. Data taken during the summer months will yield considerable additional information that can be used in the final analysis.

4.1.5.3 Other Activities

None

4.1.6 Fort Gillem

An initial site visit was conducted at Fort Gillem during the same time period as that for Fort McPherson. Two MAPs were prepared: FTGIL-001 to measure the heating season vertical temperature stratification in typical warehouses to ascertain opportunities for more efficient heating at the working level, and FTGIL-002 to measure the effect on energy consumption of turning the warehouse boilers off at night rather than using a "setback" to warm standby.

4.1.6.1 Testing Activities

Testing was conducted at Fort Gillem during the same time period as testing at Fort McPherson. The temperature stratification test (FTGIL-001) was set up in a selected warehouse to run for approximately 1 month using several battery-operated temperature recorders.

The boiler shutdown test was not completed. The test equipment and data-logging configuration were found to be inappropriate for measuring the gas flow to the boilers (the gas flow regulating valves were of the modulating type) and will need considerable development. In addition, unseasonably warm weather prevented the boilers from operating at full capacity, and there was no load or place to "dump" the steam. Therefore, this test was rescheduled for next heating season.

4.1.6.2 Test Results

During the time period of testing, the weather was unseasonably warm. Therefore, the test results for FTGIL-001 were meaningless for wintertime conditions; the test will be repeated next heating season.

4.1.6.3 Other Activities

Upon request, assistance was provided to the energy engineer in tracking down probable explanations for unusually high water consumption being billed to the site by the utility. Malfunctioning water meters were investigated as the likely explanation. No resolution to the problem was found during the time PNL was at the site.

4.2 Other Federal Installations

4.2.1 Department of Energy Hanford Site

Energy testing and procedure development using MEL equipment was carried out at the DOE Hanford Site for the Hanford Energy Management Committee (HEMC). Support to Westinghouse Hanford is provided by PNL staff to maintain and expand the site's electrical submetering systems (used to disaggregate electrical use among the three site subcontractors) and to identify opportunities for efficiency improvement.

PNL analyzed the electrical consumption data to screen five buildings for more detailed investigation of energy savings potential. Measurement plans were developed for two of these sites, and installation of submetering equipment is planned for the next reporting period. Plans were also developed for submetering steam use, as well as for a more detailed electrical monitoring system for the Plutonium and Uranium Enrichment and Extraction (PUREX) facility.

End-use electrical measurements were taken to test the effectiveness of motion detector types of lighting controls for an office building. The controls were placed on bathroom lighting and ventilation circuits. The

controls were found to significantly reduce lighting and HVAC energy requirements for the buildings and result in a less than 2-year payback. Additional testing was started for these controls in a mechanical room application.

Arrangements were made to conduct chiller efficiency tests at the Battelle Research Operations Building complex, and sensors were installed to begin the testing this summer. These procedures will be used for scheduled testing at FORSCOM installations once they are fully developed.

A plan to study the energy use of personal computers and peripheral equipment was developed at the request of the HEMC. This plan calls for the submetering of a representative sample of personal computer workstations at the Hanford Site to ascertain actual electrical consumption impacts of this equipment. The HEMC believes that these devices may be a major contributor to site-wide electrical consumption.

4.2.2 DOE Forrestal Building

The Forrestal Building in Washington, D.C., is being considered for a shared energy savings lighting retrofit project. The building operators learned of the MEL capabilities during the Energy Awareness Week display in Washington, D.C., and PNL followed up with a plan for monitoring electrical consumption in this 1.7 million-square-foot office complex. The plan has been approved and funding processed to submeter electrical use to determine consumption levels and profiles for lighting and miscellaneous plug loads. Portable monitoring equipment will be installed in May 1990.

4.2.3 Fermi National Accelerator Laboratory

Activity at the Fermi National Accelerator Laboratory has continued with the metering of the particle beam accelerator and site baseload energy use. Further monitoring of energy use this summer will be conducted to establish power levels of various aspects of the facility as equipment is shut down.

4.2.4 Lawrence Berkeley Laboratory

PNL has been metering Building 62 at Lawrence Berkeley Laboratory. This building is scheduled to be retrofitted this summer. A shared energy savings contractor will use the FEMP/MEL data collected last year in the development of the energy saving measures and the energy consumption baselines for the facility. PNL provided the most recent summaries of data to the contractor as well as assistance in interpreting the measurements. The metering equipment will be removed this summer as the contractor installs an energy management system to monitor the necessary circuits.

4.2.5 Naval Energy and Environmental Services Activity Sites

Steam distribution system analysis was carried out at the Oceanic Naval Air Station using MEL equipment. The final report recommends summer system shutdown ($136,000 annual savings) and decentralization of the steam system (1-year payback).

Submetering of steam distribution systems was carried out at the Naval Station at Long Beach to quantify steam to industrial areas, piers, and tenants. Steam metering will continue until summer 1990 to complete this multiyear project to develop industrial energy costs at Long Beach.

High-temperature hot water data were collected at 31 points at Twentynine Palms Marine Corps Base to determine system capacity and future expansion capability. Data were also collected on heat exchangers and the central plant primary loop to determine the source of vibration problems. The data were reduced and forwarded to a contractor in November 1989.

Steam distribution systems at the Norfolk Naval Station were metered to estimate loads, system efficiency, and losses in underground piping. Results showed excellent paybacks by shutting down the system in the summer and replacing the underground piping system with an aboveground system.

Salt-water pumps at the San Diego Public Works Center were metered to identify electrical problems. Harmonic tests were conducted, and a drive/motor system was rejected. NEESA plans to repair the systems by the end of this year and review a 100% submittal for the Point Loma pump system.

At the Marine Corps Base (MCB) Camp Pendleton, NEESA completed electrical and fluid metering at several bachelor enlisted quarters and dining halls to determine feasibility of small cogeneration systems. A contract was awarded to install two systems, and installation is currently under way.

Metering was conducted at the Naval Hospital in San Diego and MCB Camp Pendleton to model energy usage and size a thermal energy storage system.

The electrical distribution system at Point Mugu was analyzed to determine design for a remote metering system. One remote metering system was installed, and plans are in place for three additional systems as part of a pilot project before a more extensive system is installed for billing purposes.

NEESA developed an energy consumption baseline for Beaumont Army Hospital at Fort Bliss, Texas, to provide data for a shared energy savings contract. Later, NEESA installed a meter to test the baseline model during the current year, and will provide time-of-use electrical consumption data using a remote data collection system.

Steam and electrical consumption data at the Great Lakes Naval Hospital were collected to design a permanent metering system. The design was

completed in January 1990, and installation is anticipated by the end of the fourth quarter of 1990.

4.2.6 National Naval Medical Center (NNMC)

Testing at this facility includes the metering of building electrical loads and evaluation of the calibration of hot and chilled water flow meters. A proposal for supplemental metering of the central plant chillers and other electrical loads was developed and submitted to the Naval Facilities Engineering Command for funding.

Locations for electrical and flow metering were identified. Training was provided to NNMC electricians in the use of Dranetz 808 Power Analyzers to gather electrical energy consumption data as specified by PNL. Whole-building electrical consumption to the largest structures on site are being collected at 15-minute intervals for 9-day periods. Data diskettes are to be delivered to PNL as equipment is relocated to other facilities. Data collection and analysis for this phase of the project will continue through September 1990.

4.2.7 Merchant Marine Academy

A workplan for energy testing at the Merchant Marine Academy in Kings Point, New York, was approved by the Department of Transportation, Maritime Administration. Testing will begin in May 1990 with combustion efficiency measurements using the flue gas analysis technique for two central plant steam boilers. Locations for steam and electrical metering will be identified for subsequent evaluation this summer and next winter.

The results of this testing and analysis will be used to determine if a viable shared energy savings project exists, and to develop energy use baselines for ongoing energy management or contractor payment calculations.

5.0 TESTING EQUIPMENT AND MOBILE ENERGY LABORATORIES

5.1 Mobile Energy Laboratory Vehicles Operation

An indefinite quantity contract was awarded to T&G Express, Inc. to provide for long-haul MEL relocations. This award was made in light of new regulations requiring special endorsements for driving this class of vehicle and experience indicating that total costs will be lower than using PNL engineers or specialists as bus drivers.

Site testing experience is indicating that actual relocation and use of the MEL vehicle is seldom cost-justified. Rather, it has been found that, for most applications, it is more cost effective to ship equipment and technicians via commercial carriers. Where office space is needed and in short supply, relocation of the MEL vehicle may be cost-justified, as in cases where extensive use of flow measurement equipment is planned.

5.2 Testing Equipment Acquisition

Several new pieces of equipment were acquired during the reporting period that will enhance site testing and analysis activities. The equipment was purchased with FEMP funding (through NEESA), and also with internal PNL funding. This equipment includes

- high-quality light meter
- portable computer (used)
- analysis software
- portable thermocouple/RTD/voltage calibrator
- three portable temperature and two 8-channel survey data loggers
- walkie-talkie set
- thermocouple welder
- handheld digital multimeter (Hz, amp, kW, kVA, power factor)
- handheld digital thermometer, tachometer, humidity meter
- handheld digital volt-ohm meters.

An additional $80K of test equipment has been specified by PNL to be purchased with FEMP funding late FY90. Of that total, $37K of the equipment will be purchased with FY90 FEMP funding given directly to PNL, with the remainder purchased by NEESA with carryover FY89 FEMP equipment funds. As agreed upon in the MEL User Committee, future equipment purchases will be split between NEESA (25%) and PNL (75%).

Excess (used) field data acquisition systems for end-use metering are available from a DOE metering program. They can now be transferred to the MEL at no cost. Equivalent cost for a new unit is $3000. Several additional units will be acquired by FY 1991. These instruments are especially valuable for remote metering of large buildings or main power plants where electrical end-use and temperature data are important.

The quality assurance organization at PNL has qualified the Engineering Measurements Company (EMCO), Longmont, Colorado (EMCO flow meters), and

Dranetz Technologies Inc., Edison, New Jersey (Dranetz power analyzers) to perform calibrations of their equipment. These companies will now perform the routine calibrations, as well as repair and upgrade their equipment.

5.3 Metering and Testing Laboratory

PNL has established a new metering and testing laboratory to service MEL and related testing projects. Besides providing work space for equipment assembly, repair, and calibration, the laboratory provides a staging area for packaging and shipping test equipment to sites. PNL has found that, in most cases, it is more cost-effective to ship equipment to sites rather than transport a bus to the site. PNL has committed significant internal funding for equipment enhancements and operation of this laboratory.

6.0 DOCUMENTATION AND REPORTING

6.1 Brochures and Capability Statements

A four-page brochure entitled "Measurements for Energy Efficiency Improvement" was completed, and 200 copies were delivered to each of the Committee members in February 1990. A copy of this brochure is provided in Attachment 2. Effort continued on the development of specific capability briefs and test reports to provide follow-up information. A two-page brief was revised to provide contracting guidance to agencies interested in funding MEL applications.

6.2 Presentations

The DOE MEL was displayed at the DOE Headquarters Building in Washington, D.C., for Energy Awareness Week. Equipment was put on display and guided tours were provided by Steve Weakley and Rich Mazzucchi of PNL. During the display, representatives of the Forrestal Building expressed interest in MEL services.

6.3 Test Procedures

The goal of this activity is to develop test procedures and take each procedure through a peer review and revision process that culminates with acceptance by an appropriate standards society (e.g., ASTM, ASHRAE, IEEE). Twelve procedures for use in MEL testing activities are in various stages of development, with an additional eight procedures identified as being needed in the near future.

PNL is actively pursuing this task by becoming involved in standards societies subcommittees. In particular, PNL staff are active in ASTM Committee E06, On Performance of Building Constructions. Subcommittee E06.24.03, "Physical Tools for Diagnosis and Evaluation," has agreed to accept the procedures into the standards process that relate to testing buildings and components. In addition, Subcommittee E06.25.21, "Energy Monitoring Protocols," has agreed to accept for committee ballot and review Procedure #1 (Building Energy End-Use Monitoring), and Subcommittee E06.25.22, "Energy Performance of Whole Buildings," has agreed to accept Procedure #3 (Whole Building Performance) in the the review and ballot process when it is final drafted.

Three of the procedures developed early in the program have become appendices to the MEL Use Plan per the recommendation and vote of the MEL User Committee at the March 1990 meeting. These are

- Appendix A - MEL Application Plan (MAP Development Guide
- Appendix B - MEL Property Management Guidelines
- Appendix C - MEL Equipment, Inventory, Repair, and Accountability Guidelines.

In addition, a MEL Safety Plan has been drafted for comment by the MEL User Committee. If approved by the Committee, the MEL Safety Plan will become another appendix to the MEL Use Plan.

6.3.1 The following is the status of the MEL procedure development.

Completed

MEL Application Plan Development Guide (Appendix A to the MEL Use Plan)

MEL Property Management Guidelines (Appendix B to the MEL Use Plan)

MEL Equipment, Inventory, Repair, and Accountability Guidelines (Appendix C to the MEL Use Plan

Under Review by MEL Use Committee

MEL Safety Plan

Comments Received from the Corps of Engineers Laboratories--To Be Revised

#4 Measuring Lighting Levels
#5 New Building Commissioning Parts A and B.
(Part A is acceptance testing for the HVAC system; Part B is building bake-out.)
#6 Steam Distribution System Evaluation
#7 Electrical Distribution System Evaluation
#8 Boiler Efficiency Evaluation

First Draft at SAS for Corps of Engineers Review

#9 Heating, Ventilating and Air Conditioning System Evaluation

Under Development at PNL

#3 Whole Building Performance
#10 Chiller Performance Testing

For Standards Society Ballot and Review Process

#1 Building Energy Monitoring (ASTM)

To Be Developed

#2 Hot and Cold Water Distribution System Evaluation
#11 Fuel Quality and Delivery Evaluation
#12 Electric Motor Efficiency Testing
#13 Power Factor Determination
#14 Electric Disturbance Analysis
#15 Temperature Stratification Evaluation

#16 Controller Evaluation
#17 Building Ventilation Testing

6.4 Other Documentation

Considerable documentation is prepared by PNL for activities conducted at each FORSCOM installation. Standard formats have been developed and approved for documentation including the MEL Assignment Plans and Test Report. Copies of the documents identified below are not a part of this report but are available from the FORSCOM Project Manager.

6.4.1 Trip Reports

Initial site visits were conducted at five installations during the reporting period: Fort McPherson, Fort Gillem, Fort Stewart, Hunter Army Air Field, and Fort Irwin. Trip reports were prepared for each initial site visit. (No standard format has been proposed for trip reports.) Testing was also conducted at each of these sites. A return visit was made to Fort Irwin for repair and maintenance of metering equipment. Trip reports were prepared for each of these visits also. In the future, Initial Site Visit Reports will be prepared in a standard format that is currently under review by SAS.

6.4.2 MEL Assignment Plans

MEL Assignment Plans are prepared using the format shown in Attachment 5. During the reporting period, twelve MAPS were prepared for five sites, each receiving the necessary approvals for initiating the testing. The MAPs and dates of FORSCOM approval are listed below by site.

Site	MAP Description	Approval Date
FORT IRWIN	[Initial Site Visit 09/89]	
IRWIN-001	Electrical Distribution System Profile	10/22/89
IRWIN-002	Office Building Electrical Usage Profile	10/22/89
IRWIN-003	Office Building Lighting Levels Determination	10/22/89
HUNTER ARMY AIR FIELD	[Initial Site Visit 10/89]	
HUNTR-001	Electrical Distribution System Profile	10/31/89
HUNTR-002	Chiller Performance Evaluation	10/31/89
FORT STEWART	[Initial Site Visit 10/89]	
STWRT-001-R1	Electrical Distribution System Profile	01/02/90
STWRT-002-R1	Main Power Plant Electrical Usage Profile	01/02/90
FORT MCPHERSON	[Initial Site Visit 11/89]	
FTMAC-001	Combustion Efficiency of 2 Large Boilers	11/20/89
FTMAC-002	Building 200 Total Electrical Usage Profile	11/20/89

FTMAC-003	Combustion Efficiency of 10 Small Boilers	11/20/89
FORT GILLEM	[Initial Site Visit 11/89]	
FTGIL-001	Temperature Stratification Measurements in Warehouses	11/20/89
FTGIL-002	Boiler Shutdown Evaluation	11/20/89

6.4.3 Test Reports

Test reports are prepared after the testing activities described in the MAP are completed. They are assigned unique reference numbers that include the MAP number followed by the date of preparation. They are written in the format shown in Attachment 6. A key element of the report is the suggested recommendations for energy efficiency improvements. The MAP for the test is "closed out" and attached to the report showing the actual and estimated costs for the test and the lessons learned.

During the reporting period, two test reports were completed and submitted to SAS. These are:

Report No. IRWIN-003-90/02/09 Test Report for Fort Irwin, California, Measured Lighting Levels in Modular Office Buildings.

Report No. FSAMH-001-90/02/12 Test Report for Fort Sam Houston, Texas, Air Conditioner Controller Evaluation.

6.4.5 Other FORSCOM Documentation

PNL revised Chapter 13 "Energy Efficiency Testing" of FORSCOM Pamphlet 11-3 FORCES Command Energy Program Guide. Chapter 13 explains the scope and process of securing MEL testing at FORSCOM sites.

6.5 Other Federal Facilities Documentation

A statement of work and project management plan were developed for the U.S. Merchant Marine Academy testing. These are documented in "Shared Energy Savings Assessment Project for the U.S. Merchant Marine Academy."

A workplan for the DOE Forrestal Building Monitoring Project was developed.

An interim letter report on the National Naval Medical Center was written to justify recommendations for submetering the electrical use of the central plant. This letter report was accompanied by a proposal to conduct the metering using the MEL capabilities.

7.0 PLANNED ACTIVITIES

The following activities are planned for the period April 1, 1990, through September 30, 1990.

7.1 FORSCOM Project

- Present summary of MEL testing activities at the semiannual Energy Managers' Meeting in Savannah in mid-May.
- Initiate and complete testing at Fort Sam Houston (FSAMH-002, FSAMH-003, FSAMH-004) and Hunter Army Air Field (HUNTR-002).
- Complete testing activities started at Fort Irwin (IRWIN-001, IRWIN-002); Hunter Army Air Field (HUNTR-001); Fort Stewart (STWRT-001-R1, STWERT-002-R1) and Fort McPherson (FTMAC-001, FTMAC-002).
- Complete test reports for CARSON-001, CARSON-002, CARSON-003, FTLEWIS-002, FTLEWIS-003, FTLEWIS-005, FTMAC-001, FTMAC-002, FTMAC-003, IRWIN-001, and IRWIN-002.
- Perform an initial site visit and complete appropriate MAPs for Fort Ord and two other FORSCOM installations.
- Complete drafts of Test Procedures #2, 3, 10, and 12.
- Revise Test Procedures #4, 5, 6, 7, 8, and 9.
- Continue to work with FEMP, BPA, and Tacoma Public Utilities in assessing the potential for Fort Lewis to participate in BPA's conservation resource acquisition programs.
- Assemble information on utility incentive (demand-side) programs available to FORSCOM installations, and, where appropriate, assist the sites in factoring these programs into their energy resource management plans.
- Work with SAS to evaluate energy conservation projects recommended by the installations, primarily to identify potential incentive programs offered by utilities and third-part financing organizations.
- Complete the statement of work for FY90 funding.

7.2 FEMP

- Purchase specified equipment with FEMP funding and acquire equipment purchased through NEESA.

- Prepare and distribute minutes of Spring 1990 MEL Use Committee meeting and prepare for fall meeting in Chicago, Illinois, in November 1990.

- Present MEL capabilities at the Society of American Military Engineers meeting in Dayton, Ohio, on May 10, 1990.

7.3 Other Department of Defense and Federal Agencies

- Pursue USAF contacts through the USAF Logistics Command and arrange for transfer of management responsibility from AFESC when appropriate.

- Conduct testing activities at the U.S. Merchant Marine Academy and fully develop project plan.

- Complete testing activities at the DOE Headquarters building and submit findings and recommendations report.

- Complete electrical metering and testing at the National Naval Medical Center and identify viable shared energy savings projects and baselines. Install electrical metering system at the central plant pending receipt of supplemental funding.

- Follow up on request for services from the U.S. Department of Transportation for MEL testing at urban mass transit facilities.

8.0 SCHEDULE

The current MEL schedule is attached. Anticipated activities through September 1990 are included with the current schedule.

MOBILE ENERGY LABORATORY SCHEDULE FOR THE FEDERAL ENERGY MANAGEMENT PROGRAM

USING AGENCY	DATE	COMP. DATE	ITEM DESCRIPTION
MEL BUS/EQUIPMENT ACTIVITY:			
ARMY	04/24-08/30	090689	ARMY MEL MAINTENANCE/INVENTORY
DOE	10/11-10/13	101589	DOE MEL MOVED TO WASHINGTON DC
DOE	11/03	110689	DOE MEL EQUIPMENT SHIPPED TO PNL
ARMY	12/08-12/09	120989	EQUIPMENT SHIPPED TO FT IRWIN
ARMY	01/20-01/21	012790	EQUIPMENT SHIPPED TO FT STEWART/HUNTER
ARMY	01/20-01/21	012790	EQUIPMENT SHIPPED TO FT MCPHERSON/GILLEM
NAVY	03/01-03/01	032190	EQUIPMENT SHIPPED TO NNMC
DOE	03/30-04/20		NEW EQUIPMENT SPECIFICATIONS PREPARED
ON-SITE ACTIVITY:			
ARMY	10/02-10/06	100589	FT STEWART/HUNTER AIR FIELD INITIAL VISIT
ARMY	10/23-10/27	102589	FT MCPHERSON INITIAL SITE VISIT
ARMY	11/06-11/10	103089	FT GILLEM INITIAL SITE VISIT
ARMY	12/04-12/06	120689	FT LEWIS SUMMER TEST EQUIPMENT REMOVED
ARMY	11/27-12/01	121589	FT IRWIN TEST EQUIPMENT INSTALLATION
ARMY	12/15-07/30		FT IRWIN TESTS
ARMY	01/29-01/29	a	REMOVE TEST EQUIPMENT FROM FT CARSON
ARMY	01/29-02/10	021090	FT MCPHERSON TEST EQUIPMENT INSTALLATION
ARMY	01/29-04/08		FT MCPHERSON TESTS
ARMY	01/29-02/10	021090	FT GILLEM TEST EQUIPMENT INSTALLATION
ARMY	01/29-04/08	040190	FT GILLEM TESTS
ARMY	01/29-02/10	021090	FT STEWART TEST EQUIPMENT INSTALLATION
ARMY	01/29-08/30		FT STEWART TESTS
ARMY	01/29-02/10	021090	HUNTER AIR FIELD EQUIPMENT INSTALL #1
ARMY	06/25-06/29		HUNTER AIR FIELD EQUIPMENT INSTALL #2
ARMY	01/29-08/30		HUNTER AIR FIELD TESTS
NAVY	03/15-04/10		NNMC TEST EQUIPMENT INSTALLATION
NAVY	03/15-08/30		NNMC TESTS
ARMY	03/26-03/30		FT ORD SITE VISIT
DOT	05/01-05/02		MERCHANT MARINE ACADEMY TEST #1
DOE	05/14-06/07		FORRESTAL BUILDING TESTS
ARMY	06/04-06/15		FT SAM HOUSTON EQUIPMENT INSTALLATION
ARMY	06/05-08/31		FT SAM HOUSTON TESTS
DOT	08/30-09/30		MERCHANT MARINE ACADEMY TEST #2

[a]The equipment will remain at Fort Carson pending additional metering activity associated with a special project planned at the site in FY91.

SCHEDULE (Cont.)

USING AGENCY	DATE	COMP. DATE	ITEM DESCRIPTION
MAPS/REPORTS:			
ARMY	09/18-09/22	092589	FT IRWIN MAP
ARMY	10/09-10/20	102089	FT STEWART/HUNTER AIR FIELD MAP
ARMY	10/30-11/03	111089	FT MCPHERSON MAP
ARMY	11/10-11/17	111089	FT GILLEM MAP
ARMY	01/08-01/15	011590	FTIRWIN-003 TEST REPORT
ARMY	01/15-01/29		FTLEWIS-002,-003,-005,-009 TEST REPORTS
ARMY	02/05-02/07	021490	FSAMH-001 TEST REPORT
ARMY	02/19-03/01		FT CARSON TEST REPORTS
ARMY	04/09-04/13		FT ORD MAPs
ARMY	03/15-05/01		FTMAC-001, -002, -003 TEST REPORTS
ARMY	03/30-05/01		FTGIL-001 TEST REPORT
PROCEDURES:			
ARMY	123089	090189	NEW BUILDING COMMISSIONING DRAFT (#5)
ARMY	123089		WHOLE BUILDING PERFORMANCE DRAFT (#3)
ARMY	123089	021490	HVAC SYSTEM EVALUATION DRAFT (#9)
ARMY/DOE	030190		CHILLER PERFORMANCE TESTING DRAFT (#10)
ARMY	063090		INCORPORATE SAS COMMENTS INTO PROCEDURES
ARMY	071590		H & C WATER DIST. SYS. EVAL. DRAFT (#2)
ARMY	073090		MOTOR EFFICIENCY TEST DRAFT (#12)
OTHER:			
DOE	101589	101389	MEL BROCHURE FINAL DRAFT
ARMY	10/27-10/28	102789	WEEC IN ATLANTA
ARMY	102889	042390	MEETING WITH MR PLUNKETT/COE IN ATLANTA
DOE	10/31-11/01	110189	MEL USER COMMITTEE MEETING IN ATLANTA
ARMY	112089	112089	ENERGY MANAGERS MEETING IN KNOXVILLE
DOE	11/27-11/30	120689	MEL USE PLAN REVISED
DOE	12/01-12/05	011990	MEL BROCHURE REVISED & PRINTED
ARMY	02/13-02/15	021590	MEETING WITH MR VASILOFF IN RICHLAND
DOE	050190		CHILLER EVALUATION CAPABILITY BRIEF
ARMY	03/23-03/23	032390	MEETING WITH SAS IN ATLANTA
DOE	04/03-04/04	033090	MEL USER COMMITTEE MEETING IN SAN DIEGO
DOE	04/17-04/19		CENET MEETING PRESENTATION IN MONTERREY
DOE	05/09-05/12		S.A.M.E. MEETING PRESENTATION IN DAYTON
ARMY	05/15-05/16		FORSCOM ENERGY PROGRAM SEMIANNUAL REVIEW

ATTACHMENT 1

FORSCOM PAMPHLET 11-27, CHAPTER 13

CHAPTER 13 04/03/90
ENERGY EFFICIENCY TESTING

13-1 INTRODUCTION: Energy use data collection, recording, reduction, and analysis equipment is available to test the efficiency of energy conversion and distribution systems, as well as specific energy end-use applications at Forces Command (FORSCOM) installations. In addition, FORSCOM has supported the development of standard testing procedures, and equipment upgrades for conducting energy efficiency tests.

13-1.1 A secondary standards mobile energy laboratory (MEL) contains the specialized test equipment and procedures, and provides a secure work place when needed at a site. For many applications the test equipment is shipped to the site for deployment by trained specialists. This test equipment presently includes electrical and steam metering systems, light meter, data recorders, temperature recorders, and a digital combustion efficiency meter. A field computer is provided to process, analyze, and display data, and to support applications of A Simplified Energy Analysis Method (ASEAM) for energy usage evaluation. Ancillary equipment to calibrate sensors, and to store and process data is also available. Tools and manuals for proper installation and use of the equipment are likewise provided.

13-1.2 The equipment and the vehicle, originally funded by the Department of Energy (DOE), Federal Energy Management Program (FEMP), are available for use within Department of Defense (DoD) agencies. In conjunction with using agencies, the DOE will assign new equipment and upgrade existing equipment to meet changing requirements.

13-2 RESPONSIBILITY: The test equipment and vehicle are operated by Pacific Northwest Laboratory (PNL) for the DOE FEMP in association with other sponsoring federal agencies. PNL provides trained engineers and specialists to work with site personnel to identify and conduct tests as appropriate. PNL is also responsible for test procedure development, reporting the test results, and equipment calibration, maintenance, repair, inventory, and enhancement. The Mobile Energy Laboratory Use Plan, PNL-6861, provides the framework for the energy efficiency testing activities by federal agencies.

13-3 ASSIGNMENT OF THE MOBILE ENERGY LABORATORY: The Corps of Engineers-Savannah District (SAS), as directed by FORSCOM, will manage and coordinate the FORSCOM testing activities conducted by PNL. FORSCOM will share the test equipment and test procedures with other Department of the Army (DA) Major Commands (MACOMS) upon written request to, and as directed by, the DA executive agent for the MEL.

13-4 FORSCOM APPROVAL: FORSCOM, as the DA executive agent, has approval authority to schedule and assign testing priorities among the DA installations, and MACOMs.

13-5 REQUEST FOR TESTING AT FORSCOM INSTALLATIONS: All requests for energy efficiency testing initially identified by the installation will be transmitted in writing to SAS with a copy furnished to FORSCOM. The SAS will coordinate other testing activities at the installation being undertaken by

the Corps of Engineers testing laboratories to avoid duplication of effort. The SAS will complete Form 1.0 (attached) for each test initially requested by an installation, and transmit this request to PNL.

13-6 TESTING PROCEDURES AND CAPABILITIES: PNL will conduct an initial site visit and identify candidate tests and requirements for SAS review. A MEL Applications Plan (MAP) will be prepared for each test as specified in the Mobile Energy Laboratory Use Plan. The plan will identify equipment requirements, estimated costs and schedule for testing. The (MAP) will be submitted to the installation representative for signature and then to FORSCOM for final approval prior to starting the testing activities.

13-6.1 At present, the testing capabilities include the following:

- Fossil fuel combustion efficiency
- District heating plant delivery efficiency
- Steam distribution system evaluation
- Fuel delivery and consumption
- Electric power factor evaluation
- Electric power distribution system evaluation
- Lighting levels and lighting efficiency evaluation
- Electric end-use profiles analysis
- Indoor air quality evaluation
- Whole building infiltration and ventilation
- Electrical disturbance and power quality
- Temperature stratification and control systems evaluation

In the future, these capabilities will include:

- Thermal integrity evaluations of buildings
- Total HVAC systems evaluation and analysis
- Solar/geothermal energy assessment
- Cogeneration and heat recovery evaluation
- Installation demand-side evaluation and planning
- Fuel quality evaluation
- Electric motor efficiency evaluation

13.6.2 Testing capabilities and testing activities at the installations will be transferred by PNL to qualified contractors once the tests become well-developed. The development of the criteria for qualifying contractors will be the responsibility of PNL.

13-7 FUNDING OF ENERGY EFFICIENCY TESTING OPERATIONS: Approved testing will be performed at FORSCOM installations at no cost to the installation. A DA Project Order Form 2213 will be used to transfer funds to the DOE FEMP for FORSCOM testing. All funding for energy efficiency testing at other than FORSCOM ~~DA~~ installations will be transmitted to the DOE FEMP using the appropriate funding mechanism. Requests should be addressed to:

Mr. Richard Brancato, Director
Federal Energy Management Program, CE 10.1
U.S. Department of Energy
1000 Independence Avenue
Washington, D.C. 20585

Form 1.0
Version 1.0

MEL APPLICATION PLAN

SERVICE REQUEST

Initial [ ]
Corrected [ ]

Date Received: _____ Date Site Contacted: _____

****

Date: _____ Completed by: _____

Site ID: _____

Location: _____

_____

_____

Site Contact: _____ Telephone: _____

Alternate: _____ Telephone: _____

Initial Testing Requirement: _____

_____

_____

_____

_____

_____

Federal Organization: _____

Funds Source for Testing: _____

Schedule Expectations: _____

_____

Schedule Limitations: _____

_____

Comments: _____

_____

_____

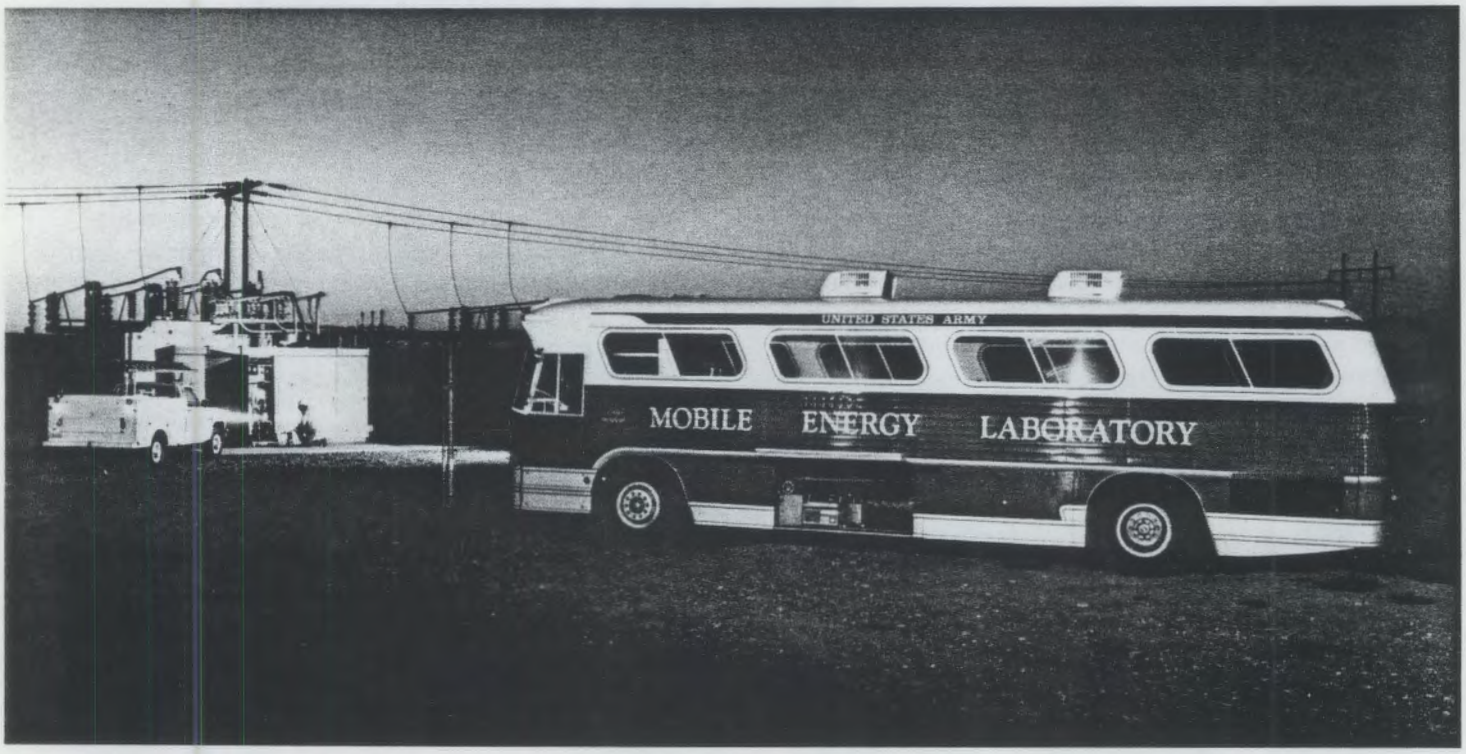
ATTACHMENT 2

MOBILE ENERGY LABORATORY BROCHURE

MEL
Mobile Energy Laboratory

Designed by the Naval Energy and Environmental Support Activity, the Army Forces Command, the Air Force Engineering Services Center, and the USDOE Federal Energy Management Program

Measurements for Energy Efficiency Improvement



Fully equipped and staffed Mobile Energy Laboratories travel nationwide to identify cost-effective efficiency improvements.

When many facilities were constructed, low-cost energy provided little incentive for energy use efficiency. Based on present and projected energy prices, efficiency improvements can significantly reduce costs while improving comfort and operational effectiveness.

Facility managers consider many factors to optimize energy efficiency while minimizing operating costs. Since numerous options offer tremendous potential to provide peak efficiency, decision makers need to know which efficiency improvements offer the greatest return on investment. A reliable energy performance evaluation is desirable to prioritize cost-saving opportunities and measure project success.

The U.S. Department of Energy's (DOE) Federal Energy Management Program (FEMP) has developed a unique energy measurement and equipment testing program to provide accurate data and information. The testing program relies on a fleet of mobile laboratories and a cadre of technical specialists working with local personnel.

Mobile Energy Laboratories (MELs) combine the equipment and expertise required to measure energy end-uses, identify cost-effective efficiency improvements, and evaluate a full range of energy cost-reduction strategies. The skills and equipment of the DOE National Laboratories are available as needed to strategically support energy management programs.

Mobile Energy Laboratories

MELs are fully equipped with state-of-the-art energy metering and analysis systems. Because they are mobile, these laboratories are capable of conducting comprehensive energy-use evaluations nearly everywhere. Four separate MELs are operated by DOE's Pacific Northwest Laboratory (PNL) and available to Federal agencies by contracting with FEMP.

Recent MEL applications identified a variety of opportunities for energy savings. End-use electricity measurements for buildings at Ft. Carson, Colorado, identified the potential for improved lighting control and HVAC equipment upgrades. Continuing measurements document the high level of energy savings achieved as improvements take effect. Other MEL measurements at the Fermi National Accelerator Laboratory in Chicago, Illinois, resulted in projects now saving more than $250,000 per year with a simple payback of less than two years.

Specific information on testing capabilities, equipment, procedures, and test results from these and other MEL evaluations are available by contacting the PNL representatives listed on the back page. These individuals will help you determine if the MEL staff and equipment can facilitate a more energy-efficient future for your agency.

Specially trained MEL technicians use portable computers to verify quality of data from multipurpose load recorders.

MEL Capabilities

Electrical Energy Consumption Studies

Each MEL is equipped to accurately measure electrical energy consumption characteristics such as power, voltage, current, and power factor. Measurements for entire facilities, single buildings, or specific circuits are made. To determine various electrical consumption profiles of the facility and the coincidence of particular energy demands, time-series measurements of concurrent electrical loads are conducted. These measurements can be automatically communicated to laboratory or on-site desk-top computers for near real-time observation and analysis.

Analyses of District Systems

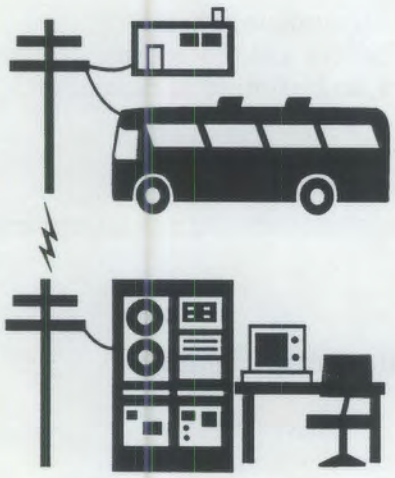
The overall efficiency of steam and hot or chilled water generation and distribution to individual buildings are carefully assessed and accurately evaluated by MEL. Systems are measured at multiple points to calibrate existing instrumentation, identify leaks, evaluate efficiencies, and determine loads. Subsequent analysis of these measurements results in an accurate evaluation based on a variety of interpretive data. Measurements can be collected as a time-series to study load profiles, establish control strategies, and evaluate efficiency improvements.

MEL staff uses the most advanced steam-flow-metering equipment available. (clockwise from bottom) Insertion turbine probe, multichannel data logger, data recorder, and flow computer.

Boiler and Combustion Efficiency Evaluation

The efficiency of fossil-fueled equipment can be determined by using a digital flue gas analyzer. This device indicates the efficiency of combustion under various firing rates. When testing, an on-board microprocessor immediately calculates and displays combustion efficiency. The tests establish the performance curve of the equipment so that a comparison can be made with the manufacturer's specifications. Further investigation of boiler controls, burners, and air supply systems may be completed to pinpoint operational problems, maintenance requirements, or justify equipment retrofit or replacement.

Field Data Acquisition System



Data are transmitted from the MEL equipment via telephone lines to a central computer at the Pacific Northwest Laboratory for analysis.

Data-logging instruments installed at each facility measure energy consumption and determinants to understand energy end-uses and causes.

An on-board computer and custom-made software will immediately analyze and verify the validity of the data being acquired. The computer also is used to produce reports of test results and analyze potential energy efficiency improvements. In addition, it can communicate electronically with installed field data acquisition systems and the staff and computers at PNL.

Additional capabilities are developed as new test equipment and energy-efficiency technologies become available. Staff members at PNL are continuously exploring innovative methods of acquiring and analyzing energy performance data, and will work with you to customize approaches and capabilities to suit particular needs. As experience builds, standard testing procedures are developed to minimize costs and ensure the highest quality results.

Application Process

It is simple to use MEL Capabilities:

1. Learn More
A telephone conversation with staff from PNL can help you determine if the MEL services are a cost-effective alternative to meet your specific requirements.

2. Make Contact
A second telephone call to the appropriate MEL Use Committee representative can provide contracting and scheduling guidance. The representative can provide sample contracting forms and a schedule of available service dates.

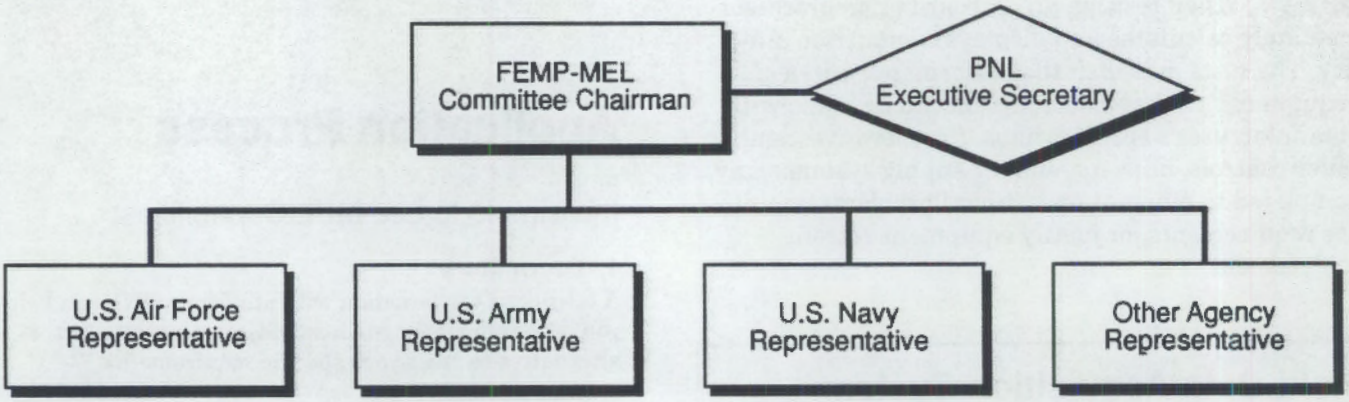
3. Arrange a Visit and a Plan
Once a contract is in place, staff members from PNL conduct an initial site visit. They will review testing requirements and available energy use information and collect information to develop a detailed MEL Applications Plan (MAP). The MAP will indicate specific tests to be conducted, estimate the time and level of effort required, and provide the necessary contact information to schedule the tests.

4. Develop a Schedule
After your agency and PNL have approved the MAP, the staff and equipment needed to execute the plan are scheduled. Staff members from PNL coordinate on-site activities with the facility energy manager or representative. Coordination includes locating the MEL, arranging for equipment installation, conducting the testa, and collecting and analyzing the data.

Test results are provided as soon as they are verified, and a summary report will be prepared following all scheduled tests to itemize recommendations for energy efficiency improvements.

Staff from PNL also can provide training and equipment for ongoing performance evaluations as well as continued consultation on energy management issues.

Mobile Energy Laboratory Use Committee



Representatives from every user agency work together as a team to provide MEL's unique services. They have produced a MEL Use Plan (PNL-6861) to provide easy-to-follow guidelines and procedures. The Use Committee schedules MEL assignments, conducts operational reviews, and coordinates capability enhancements.

Funding

Federal agencies can access MEL capabilities through an efficient funding mechanism. Services can be enlisted through the DOE FEMP Office via an Interagency Agreement, Memorandum Purchase Order, or other similar document. All overhead and charge-out rates have been established.

Typical work requests normally can be processed within four working days once the requesting agency submits a statement of work and proper documentation to FEMP. DOE then verifies with PNL the scope of work and required resources. Following approval of a final project cost proposal, work will be initiated.

For further information please contact:

Richard P. Mazzucchi, Executive Secretary
Mobile Energy Laboratory Use Committee
(509) 375-3606

Graham B. Parker, Senior Research Engineer
Mobile Energy Laboratory Applications
(509) 375-3805

Pacific Northwest Laboratory
PO Box 999
Richland WA 99352

The Pacific Northwest Laboratory is operated for the U.S. Department of Energy by Battelle Memorial Institute.

061-89-11-10-1464

☆ U.S. GOVERNMENT PRINTING OFFICE: 1990-791-873

ATTACHMENT 3

MEL USE COMMITTEE MEETING MINUTES

MINUTES OF THE MOBILE ENERGY LABORATORY USE COMMITTEE MEETING
OCTOBER 31-NOVEMBER 1, 1989 ATLANTA, GEORGIA

At approximately 900 hours on October 31, 1989 the Mobile Energy Laboratory Use Committee Meeting was called to order at the Ramada Hotel in Atlanta GA. The agenda for the meeting is provided in Attachment 1. This agenda was generally followed with the exception that the discussion of U.S. Army MEL applications was started on Thursday morning rather than Wednesday afternoon.

The following individuals were in attendance:

K. Dean DeVine -	DOE FEMP, MEL Use Committee Chairman
Rich Mazzucchi -	PNL, MEL Use Committee Executive Secretary
Jim Vasiloff -	FORSCOM, U.S. Army MEL Use Committee Representative
Bill Riches -	FERMI Labs, Other Federal Agency MEL Use Committee Representative
Rich Szydlowski -	PNL, MEL Field Operations Representative
Graham Parker -	PNL, MEL Project Manager

Mr. Michael Santoro, U.S. Air Force MEL Use Committee Representative, and Mr. Bill Messock, U.S. Navy MEL Use Committee Representative were not in attendance. However, with three voting members a quorum existed and official business was conducted. The meeting was adjourned at approximately 1500 hours on November 1, 1989. The next meeting is scheduled in March of 1990 in San Diego, CA.

Ten action item/decisions from the meeting are described in these meeting minutes. Significant action item are identified in Table 1. The table identifies the person(s) having action responsibility and the anticipated action completion date. If your name appears in this table be sure to carefully read the item description and take the appropriate action. Questions or clarifications of these minutes should be directed to the executive secretary (509) 375-3606 during regular business hours PST.

Table 1: MEL Use Committee Action Items

Item	Action Persons	Action Date	Title
1	Mazzucchi	121589	Propose Revisions to MEL Use Committee Charter
2	Mazzucchi	121589	Propose Revisions to MEL Use Plan
3	Mazzucchi	010190	Distribute MEL Brochures to MEL Committee
4	DeVine Santoro	020190	Secure USAF participation if possible and prepare addenda for Use Plan
5	DeVine Messock	010190	Determine NEESA equipment and funding status and prepare addenda for Use Plan
6	Szydlowski Parker	020190	Finalize listing of MEL equipment additions
7	Messock Szydlowski	041490	Procure and deliver MEL equipment to PNL
8	Parker Mazzucchi	010190	Establish MEL Suspense listing such that confirmation dates are 60 days ahead
9	Messock Mazzucchi	020190	Establish MEL Use Schedule for Navy MEL
10	Mazzucchi Kohlman	121589	MEL Driver subcontract in place

The meeting was called to order. The executive secretary explained that the Navy representative was unable to attend because of recent staff change over and prior commitments. The executive secretary also indicated that he had been contacted by Mr. Santoro just prior to the meeting and was informed that he was unable to get approval to attend from his AFESC management. Although the USAF and USN representatives were not in attendance, the balance of the members constituted a quorum so that official business could be transacted.

The first order of business was approval of the minutes for the previous committee meeting on March 8 and 9, 1989. These minutes were distributed to the committee members in advance of the meeting and were unanimously approved without comment.

The agenda for the meeting was discussed (see Attachment 1) and the meeting proceeded in this fashion. Following a break, the committee discussed the status of the MEL Use Plan (PNL-6861) and the committee charter. Items 1 and 2 below summarize these discussions.

Item 1: Revision to MEL Use Committee Charter. The charter for the MEL Use Committee dated August 15, 1989 was reviewed and a number of revisions and updates were suggested by the executive secretary and discussed by the committee. A proposed revision to the committee charter that incorporates revisions as recommended by the committee will be distributed by the executive secretary. The voting members will be requested to return signed approval copies of the charter or to provide alternative language as appropriate for subsequent consideration.

Item 2: Revision to MEL Use Plan. Revisions to the MEL Use Plan (PNL-6861) dated April 1989 were suggested by the executive secretary and discussed by the committee. Proposed revisions to the plan will be distributed by the executive secretary in addition to three appendices that are proposed for addition to the plan. These appendices provide guidelines for preparation of MEL Application Plans, MEL property management, and MEL equipment inventory, repair, and accountability.

The voting members will be requested to return approved or modified copies of the listing of proposed revisions to the executive secretary as soon as possible so that the document can be updated prior to the next committee meeting.

The next item of business was a discussion of the MEL brochure and related education efforts. The executive secretary provided information on MEL education efforts including: 1) display of the DOE MEL during Energy Awareness Week at the DOE Headquarters building in Washington DC, 2) incorporation of the MEL photo and descriptive text into the DOE Office of Conservation displays prepared by SERI, and 3) preparation of view graphs of the MEL for Infrastructure Modernization briefings. The costs of these materials have been shared by the FEMP and FORSCOM. Item 3 below describes the status of the MEL brochure and committee directed action.

Item 3: Publish MEL Brochures. A draft final four page brochure prepared by PNL to advertise the MEL's was distributed to the committee for review and comment. It was decided to add a reference to the MEL activities at the Fermi National Accelerator Laboratory and to make several editorial revisions as suggested by Dean DeVine and Jim Vasiloff. The general layout and flow was felt to be appropriate for the intended audience. The chairman directed that a moderate number of copies be reproduced so as to take advantage of the economies of scale available and to permit updated versions to be printed without excessive waste.

Issues relating to MEL participation by the U.S. Air Force and other federal agencies were discussed. Committee discussion and decisions pertaining to this matter is described in Item 4 below.

Item 4: USAF and Other Agency Participation. Issues pertaining to securing and administering MEL support for the U.S. Air Force and other federal agencies were discussed by the committee. With regard to the USAF, it has been hoped (promised?) that the Air Force Engineering Services Center, would allocate approximately $100K per year to activate

and administer a MEL for USAF installation activity. Since this has not occurred as yet the committee directed that 1) PNL explore the viability of a "complementary" MAP for Peterson AFB to stimulate "grass-roots" interest at the installation level and 2) that the chairman work through appropriate channels to secure command support for this important federal initiative.

The concept of complementary MAPs (for which costs could be recovered if subsequent MEL testing resulted) was advanced by Bill Riches. In this way the initial cost barriers for MAP preparation may be overcome as the installation staff would be provided with sufficient information to sell the concept internally with the cost and benefit information that a MAP provides. PNL will explore this concept, and its implications on the FEMP/MEL budgets, and report progress at the next meeting.

Following a break for lunch the committee reconvened to discuss MEL applications and procedures development. Graham Parker of PNL informed the committee regarding the current status of the various procedures that have been drafted or are under development. A listing of this information is provided as attachment 2. Several of the procedures have been submitted to the U.S. Army Corps of Engineers for review and comment at the direction of Mr. Vasiloff. Graham has been unable to schedule a meeting with the Corps to discuss this and other MEL matters despite several attempts. PNL will await Corps comments before finalizing the procedures. Graham also described PNL plans to submit selected procedures to the American Society of Testing and Materials (ASTM) and or IEEE for consensus approval and to stimulate widespread adoption. PNL has been collecting material for procedures from various sources including ASHRAE, ASTM, the Boiler Institute, and other trade and professional associations.

The status of DOE MEL applications was described by Bill Riches of Fermi Labs. He handed out and described materials pertaining to several MEL projects conducted at Fermi including: 1) energy metering survey of the 16 story Wilson Hall office/research building that included use of the Dranetz power analyzers

to study end-use electrical loads and identify conservation potentials, 2) power monitoring of the experimental areas (beam lines) at Fermi labs during the shut down period to identify base loads at each of 49 electric substations using the Dranetz and Techtrans equipment, and 3) a summary of the results of these and other MEL applications at Fermi labs during FY89. This last item is provided as attachment 3.

The executive secretary added that the DOE MEL was transported from Fermi Labs to Washington DC in October 1989 for display during Energy Awareness week at DOE Headquarters, and for subsequent testing at the National Naval Medical Center (NNMC). The equipment from the MEL was shipped to PNL for calibration and maintenance prior to application at NNMC.

The meeting was adjourned for the day at approximately 5 PM after agreeing to defer discussion of Army MEL applications until Wednesday morning.

On November 1, 1989 the meeting was reconvened with the same individuals present from the previous day. Graham Parker described the testing and MAP development activities for the FORSCOM installations, and Rich Szydlowski detailed the preliminary results of testing at Ft. Carson, Ft. Sam Houston, and Ft. Lewis. A summary of these results is provided in Attachment 4. Graham Parker summarized the suspense schedule for MEL activities, shown in Attachment 5. Action Items 5 and 6 below summarize decisions by the committee pertaining to the MEL suspense schedule.

Item 5: Establish MEL Schedule with 60 day Lead Time. The committee directed PNL to maintain the suspense schedule such that a 60 day window of confirmed activities are planned. This will facilitate optimal routing and scheduling for MEL equipment and staff, and provide ample notice to using agencies regarding PNL and other schedule commitments.

Item 6: Establish MEL Use Schedule for Navy MEL. In order to efficiently administer the MELs it is necessary to incorporate NEESA applications into the MEL schedule. The executive secretary was directed

to work with the USN committee representative to determine NESSA schedules, and incorporate these into the MEL suspense schedule if possible.

The next item of business was a discussion of MEL equipment and proposed capability enhancements. The executive secretary reported that significant uncertainties remain regarding the status of NEESA procured equipment and resources for equipment procurement. This uncertainty is adversely affecting MEL application and planning, and must be removed as soon as possible. The committee decisions and guidance pertaining to this issue is indicated in Items 7, 8 and 9 below.

Item 7: NEESA Equipment and Funding Status. Rich Szydlowski (MEL Field Operations Representative) described to the committee the present status of MEL equipment and the support of NEESA in this area. He expressed frustration with the delays associated with equipment procurement, and the uncertainties regarding the amount of funding available at NEESA to support this activity. The executive secretary indicated that recent personnel changes at NEESA had apparently caused some confusion, and that Mr. Messock is to be our NEESA contact.

Item 8: Procure and Deliver MEL Equipment to PNL. The chairman indicated that NEESA shall be directed to expend the current funding they have in hand (once this amount is determined) to procure the items that have been identified. Remaining funds would be used to procure additional high priority items to be identified by PNL once the available funding is ascertained.

The executive secretary also indicated that there is uncertainty surrounding the present inventory and ownership of the Navy MEL. NEESA has exchanged, updated, and otherwise altered the inventory, and is unsure if sufficient funding is available to fully equip the MEL to match the inventory on the other MELs. The chairman indicated that a meeting would be needed at Port Heuneme to be attended by the chairman, executive secretary, and Mr. Messock, to resolve these equipment and funding issues.

Item 9: Finalize Listing of MEL Equipment Additions. The listing of equipment additions previously prepared by PNL was reviewed with the committee, and the status of procurements through NEESA was discussed. Once the status of current procurements and NEESA funding for this activity is known, PNL was directed to update and finalize the supplemental equipment to be ordered. The following items were provisionally approved for purchase within the available funds: 1) supplemental data recorders, 2) lap top computers for field data acquisition system set-up and interrogations, 3) radio telephone communications equipment, and 4) radio modems.

The next item of business was a discussion of subcontracting issues held in executive session. The principal issue pertained to the contract terms to be used for a professional driver for long-haul MEL relocations. The executive secretary indicated that PNL had completed the competitive selection of the driver(s) and was currently negotiating the contract. It was agreed to utilize a cost per mile type reimbursement with additional reimbursement for standby time that may be required for MEL maintenance and return travel of the driver. An indefinite quantity type contract will be negotiated stipulating the cost-per-mile for driving, and cost-per-hour for standby time. A cap for each relocation will be established and cost in excess of this cap must be approved in advance by the technical administrator (executive secretary). Item 10 below summarizes committee direction in this matter.

Item 10: Negotiate MEL Driver Subcontract. The executive secretary was directed to complete negotiations with the competitively selected driver as soon as possible and to ensure that the terms of the contract will provide for the most cost-effective and safe relocations possible.

The final order of business was a discussion of the time and place for the next MEL Use Committee meeting. Mr. Riches suggested that it may be desireable to have this meeting in conjunction with the DOE In-House Energy Management (IHEM) annual meeting in San Diego, CA next March. In this way

travel costs could be at least partially offset, and the executive secretary may be able to make a presentation regarding MEL to the DOE/IHEM personnel. The members agreed that this seemed to be an appropriate time and place and directed the executive secretary to make the necessary arrangements.

The meeting was adjourned at approximately 3pm on November 1, 1989.

ATTACHMENT 1: MEETING AGENDA

MOBILE ENERGY LABORATORY USE COMMITTEE
WINTER 1989 MEETING

TUESDAY OCTOBER 31, 1989

7:30AM	BREAKFAST AT HOTEL RESTAURANT (OPTIONAL)
9:00AM	MEETING BEGINS, INTRODUCTIONS AND BACKGROUND
9:30AM	REVIEW AND APPROVAL OF MINUTES FROM RICHLAND MEETING
10:00AM	BREAK
10:15AM	MEL USE PLAN AND COMMITTEE CHARTER
11:00AM	MEL BROCHURES AND EDUCATION EFFORTS
12:00	LUNCH
1:30PM	OVERVIEW OF MEL APPLICATIONS AND PROCEDURE DEVELOPMENTS
2:00PM	DOE MEL APPLICATIONS
2:30PM	U.S. NAVY MEL APPLICATIONS
3:00PM	BREAK
3:15PM	U.S. ARMY MEL APPLICATIONS
5:00PM	ADJOURN
6:30PM	DINNER - TBD

WEDNESDAY NOVEMBER 1, 1989

7:30AM	BREAKFAST AT HOTEL RESTAURANT - (OPTIONAL)
9:00AM	COMMITTEE CONVENES - MEL USE SCHEDULE
10:30AM	BREAK
10:45AM	MEL EQUIPMENT ANO CAPABILITY ENHANCEMENTS
12:00	LUNCH
1:30PM	ORGANIZATIONAL ISSUES
2:00PM	ACTION ITEM REVIEW
3:00PM	MEETING ADJOURNS

ATTACHMENT 2: STATUS OF PROCEDURE DEVELOPMENTS

The following Procedures have been drafted and submitted for FORSCOM review (latest version date given in parenthesis).

#1 Procedure Manual For Mobile Energy Laboratory Application Plan (06/89)
#2 Procedure Manual For Vehicle Commissioning And Maintenance (06/89)
#3 Procedure Manual For Property Control and Calibration (06/89)
#4 Procedure Manual For Measuring Lighting Levels in Buildings (06/89)
#5 Procedure Manual For New Building Commissioning-Part A & B (07/89)
#6 Procedure Manual For Steam Distribution System Evaluation (07/89)
#7 Procedure Manual For Electrical Distribution System Evaluation (08/89)
#8 Procedure Manual For Boiler Efficiency Evaluation (08/89)

At a FORSCOM review meeting in October, PNL agreed to make the appropriate sections of Procedures #1, 2, and 3 that are not PNL-specific, appendices to the MEL Use Plan document, dropping the procedure numbers. The next [new] procedures developed would then assume these numbers.

Reference material was collected and outlines drafted for #9 Procedure Manual For Building Heating Ventilation and Air Conditioning (HVAC) System Evaluation, #10 Procedure Manual for Chiller Performance Testing, and Procedure Manual For Evaluating Whole Building Performance [New #3]. Material was collected and a first draft prepared for Procedure Manual For Building Energy Monitoring [New #1]. The [New #2] Procedure Manual For Evaluating Hot and Chilled Water Oistribution Systems, will be prepared based on material in Procedure #6.

ATTACHMENT 3: DOE MEL ACTIVITIES AT FERMI LABS

Fermilab

Fermi National Accelerator Laboratory
P.O. Box 500 • Batavia, Illinois • 60510

September 28, 1989

To: Dr. Karel Klima
U.S. Department of Energy
Argonne, Illinois

From: William Riches

Subject: FY 1989 Utilization of DOE Mobile Energy Laboratory (MEL)
and FY 1990 Utilization Work Plan

FY 1989 MEL Utilization

Baseline summer and winter electrical loading on 49 substations throughout the Experimental Beam Lines was monitored to establish building loads without experimental equipment being energized. The summary report is attached. As an outgrowth of these studies the following In-House Energy Management retrofit projects were generated:

1. Replacement of electric with natural gas hot water boilers in two buildings; construction completion November, 1989.

2. Replacement of electric with natural gas hot water boiler in the Proton Pagoda, and electric with gas unit heaters in the Proton Assembly Building; FY 1990 retrofit project.

3. Replacement of electric unit heaters with natural gas infra-red radiant heaters in five experimental buildings; FY 1990 retrofit project.

4. Installation of metal halide lighting with time of day controls in four experimental buildings; three buildings completed; one building - FY 1990 retrofit project.

Annual energy savings resulting from these projects will be 59,000 MMBTU; energy cost savings $269,000/year; simple payback 1.3 years.

In addition to the above, MEL was utilized in an FY 1989 study for the conversion of five industrial type buildings, totaling 110,000 sq. ft., from electrical resistance to natural gas heating. This study resulted in an FY 1991 IHEM retrofit project funding proposal in excess of $1 million, which would result in an annual energy savings of 16,000 MMBTU and a cost savings of $139,000/year.

FY 1990 MEL Utilization Work Plan

The DOE Mobile Energy Laboratory will be available for inspection by Secretary of Energy, Admiral James D. Watkins during his visit to Fermilab on October 7, 1989.

The Fermilab Research Division is now preparing the beam line experimental areas for a seven month fixed target run to begin in January, 1990. Preliminary equipment testing will begin in October and will continue into December when all beam lines will be turned on in preparation to receive beam early in January, 1990. Since the beam line equipment has been upgraded for this run and some areas will be heavily loaded, MEL will be utilized to monitor selected electrical substation loading from October through December and to monitor more than 50 substations from January through March, 1990. This load monitoring will establish total machine loads added to the winter baseline building loads previously monitored.

During the fixed target beam line run the Collider Program will not be operating, providing the opportunity to utilize MEL to establish baseline collider building loads at several locations through FY 1990 winter and summer months.

The Mobile Energy Laboratory has been most valuable to Fermilab as an assistance in analyzing energy demands and consumption and in identifying opportunities for energy and cost savings. It will continue to be utilized for these purposes in the future.

W2. Fisher

ATTACHMENT 4: TEST STATUS AND RESULTS FOR FORSCOM MEL EFFORTS

MOBILE ENERGY LABORATORY (MEL) REVIEW

TEST STATUS AND RESULTS FOR:

- FORT CARSON, CO
- FORT LEWIS, WA
- FORT SAM HOUSTON, TX

BY

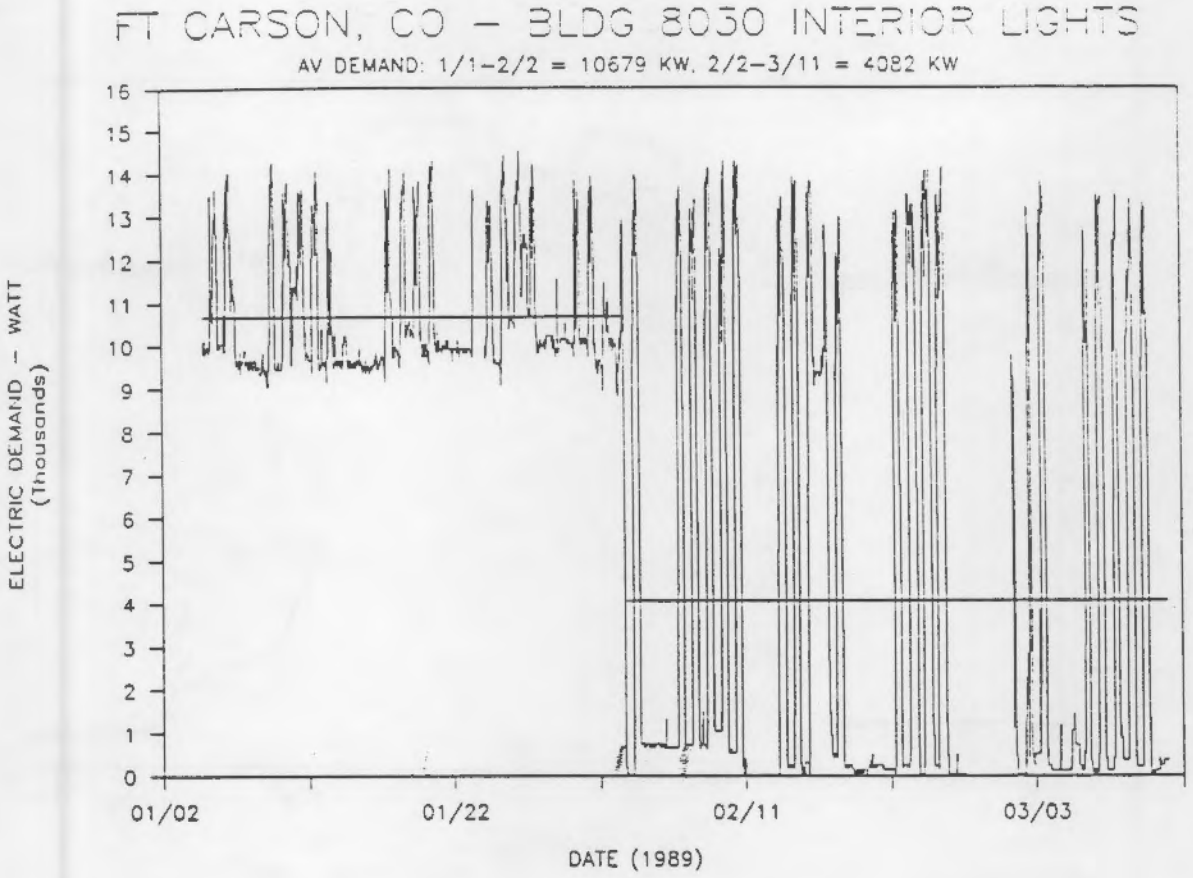
RICHARD F. SZYDLOWSKI

FORT CARSON, CO - TESTS

- BUILDINGS 8000 AND 8030 END-USE ELECTRICAL MONITORING
- EVALUATION OF ELECTRIC SUBSTATION DEMAND PROFILES
- BUILDINGS 8000 AND 8030 INTERIOR AIR TEMPERATURE SURVEY
- HEATING PLANTS BOILER COMBUSTION EFFICIENCY SURVEY
- DETAILED BOILER MONITORING DURING WASTE OIL FIRING

FT CARSON: END-USE ELECTRICAL MONITORING

- BLDGS 8000 AND 8030, LARGEST BUILDINGS AT FT CARSON
- 2 PNL COMMERCIAL FDAS LOGGERS
- 15-MINUTE DATA (WATT, AIR TEMPERATURE, PYRANOMETER)
- DATA COLLECTED NIGHTLY BY PNL VIA TELEPHONE MODEM
- LIGHTING AND AIR COMPRESSOR MOD SAVINGS: $5.5K/YR
- TEST PERIOD: 12/20/88 - CONTINUING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ELECTRIC DEMAND – WATT (Thousands)
16
15
14
13
12
11
10
9
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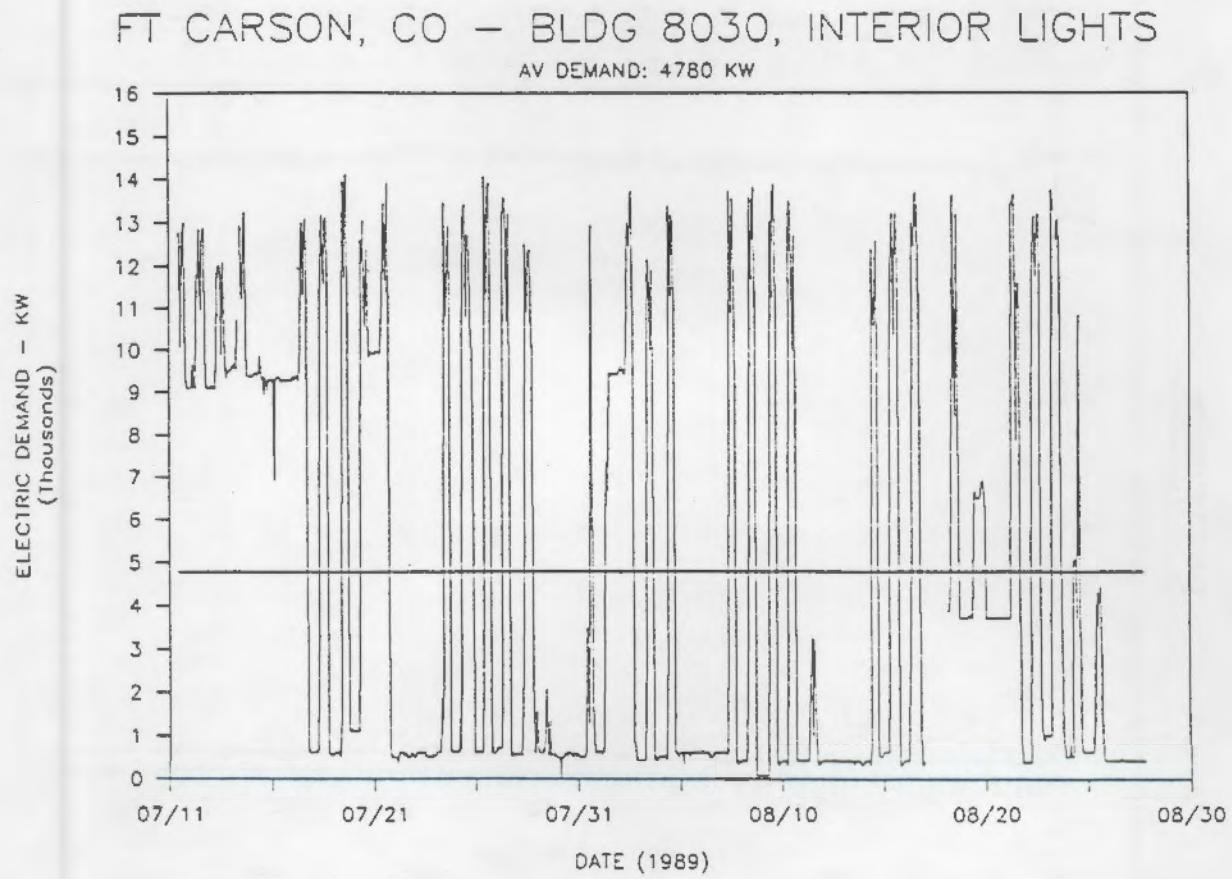
7
6
5
4
3
2
1
0
01/02
01/22
02/11
03/03
DATE (1989)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ELECTRIC DEMAND – KW (Thousands)
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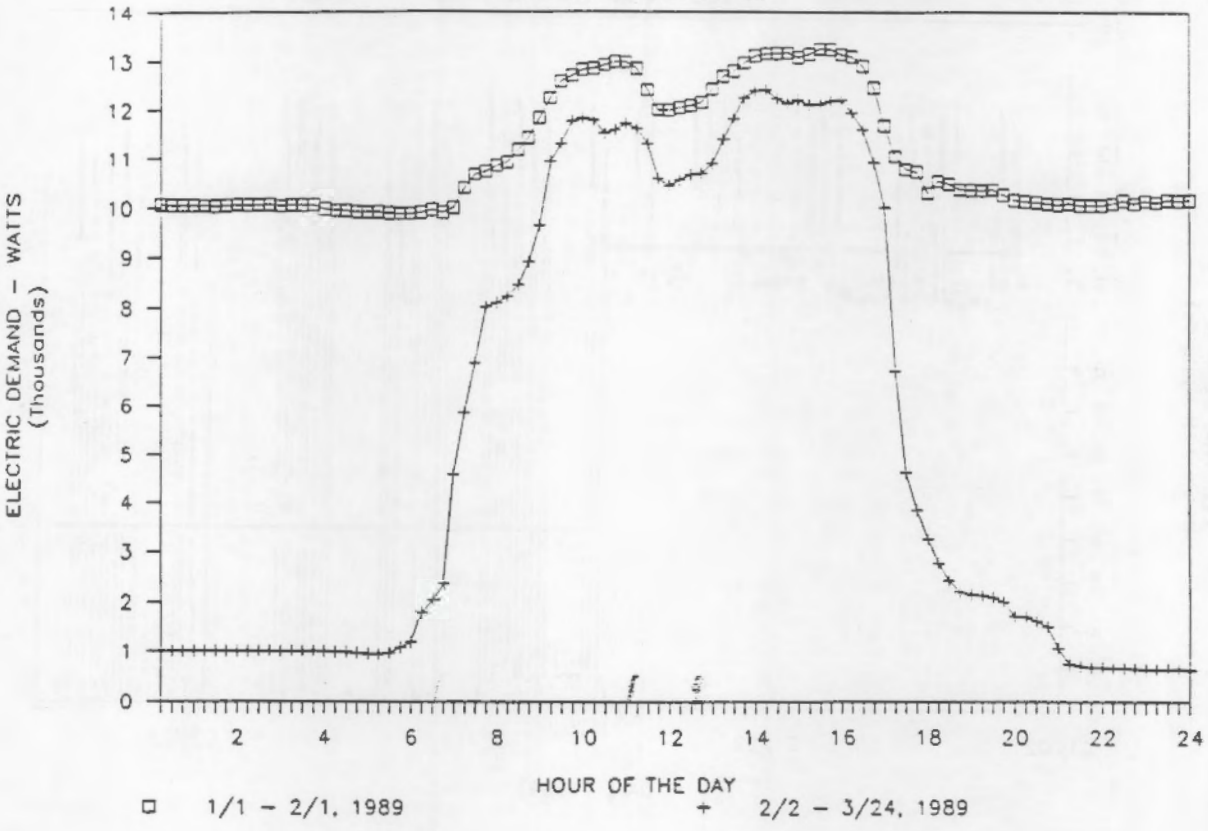
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
07/11
07/21
07/31
08/10
08/20
08/30
DATE (1989)

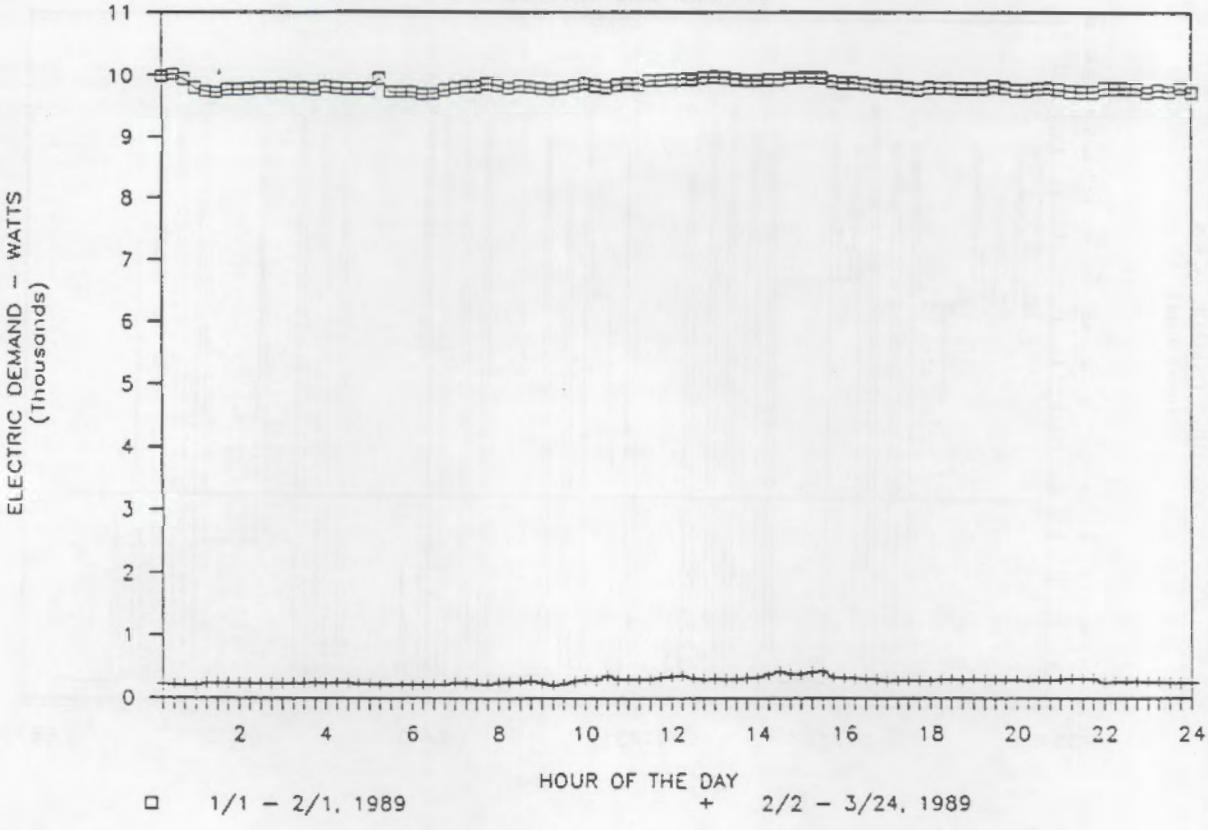
FT CARSON – BLDG 8030, INTERIOR LIGHTS

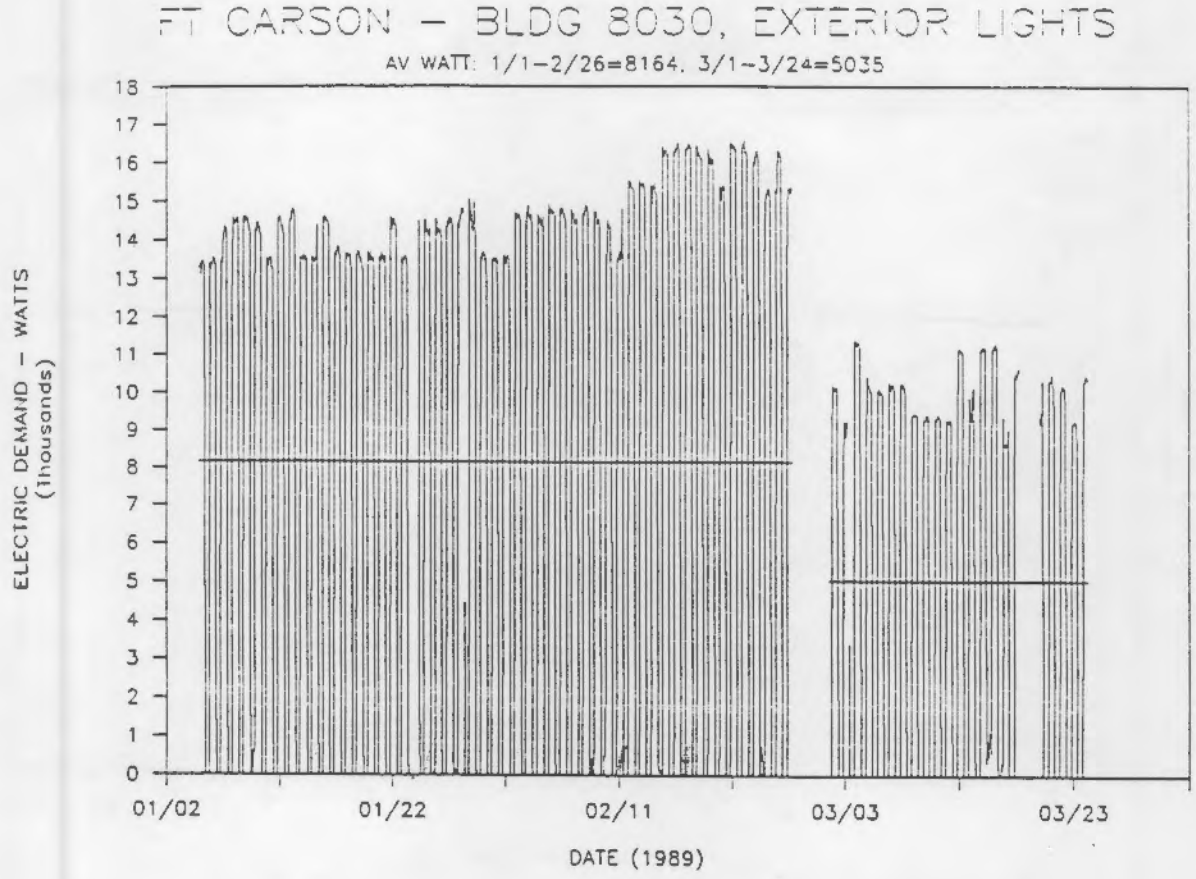
WEEKDAY DAILY PROFILE



FT CARSON – BLDG 8030, INTERIOR LIGHTS

WEEKEND DAILY PROFILE




FT CARSON – BLDG 8030, EXTERIOR LIGHTS
AV WATT: 1/1-2/26=8164. 3/1-3/24=5035
ELECTRIC DEMAND – WATTS
(Thousands)
18
17
16
15
14
13
12
11
10
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1
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01/02
01/22
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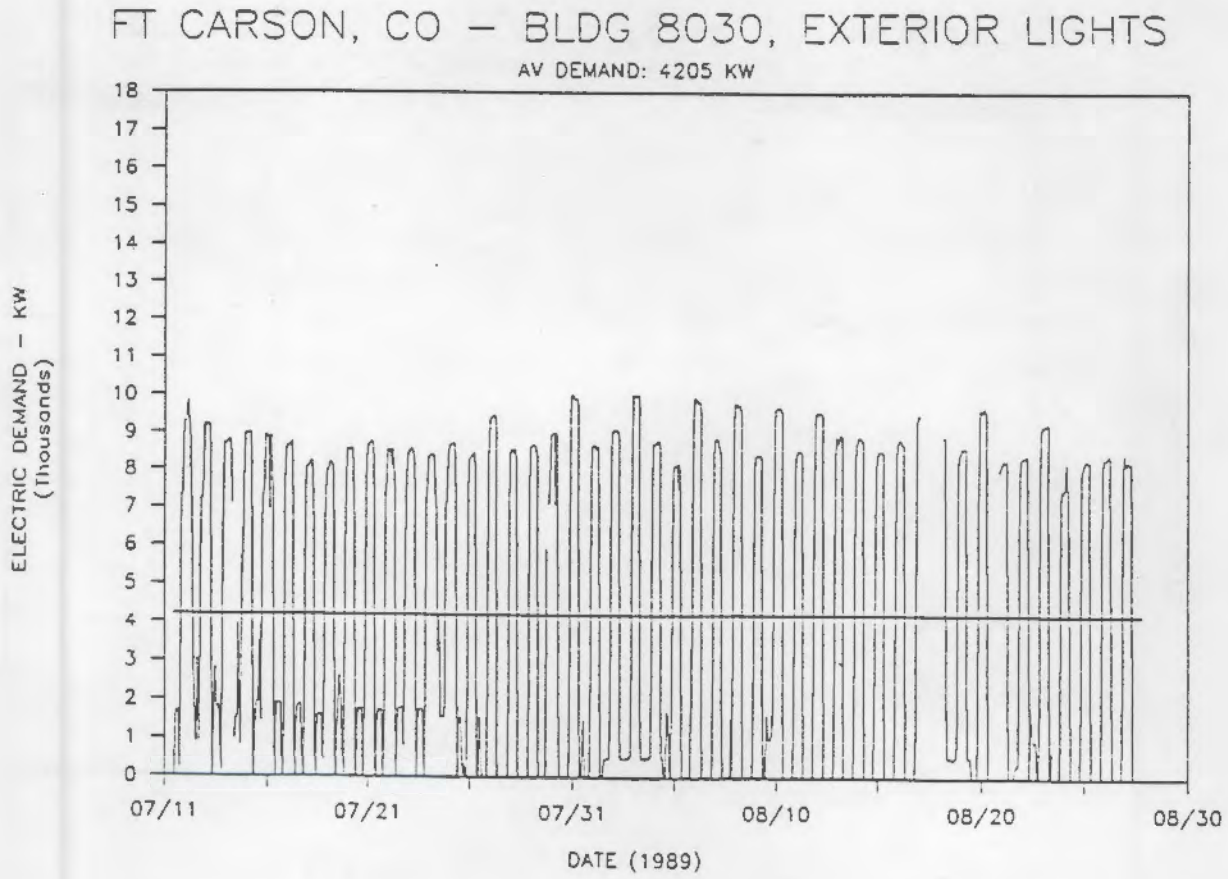
03/23
DATE (1989)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ELECTRIC DEMAND – KW
(Thousands)
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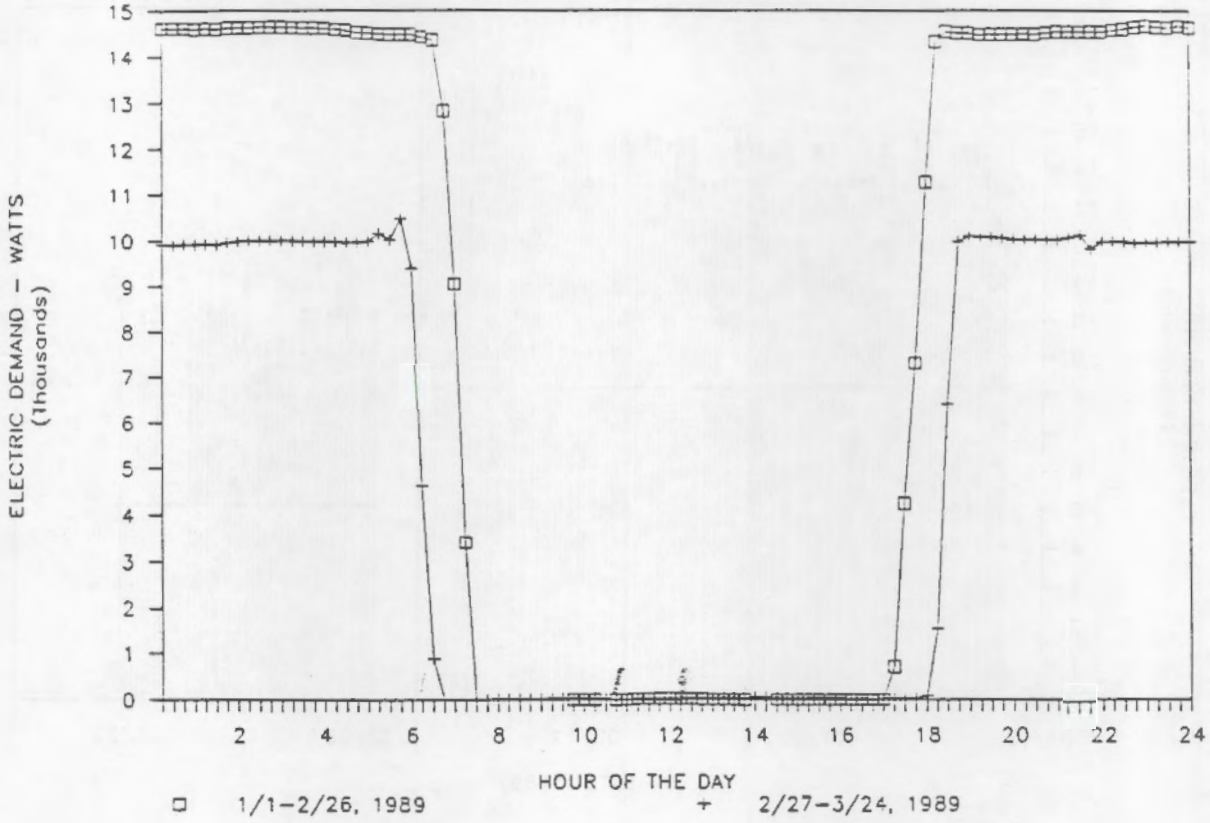
12
11
10
9
8
7
6
5
4
3
2
1
0
07/11
07/21
07/31
08/10
08/20
08/30
DATE (1989)

FT CARSON, CO – BLDG 8030 INTERIOR LIGHTS

WEEKDAY DAILY PROFILE



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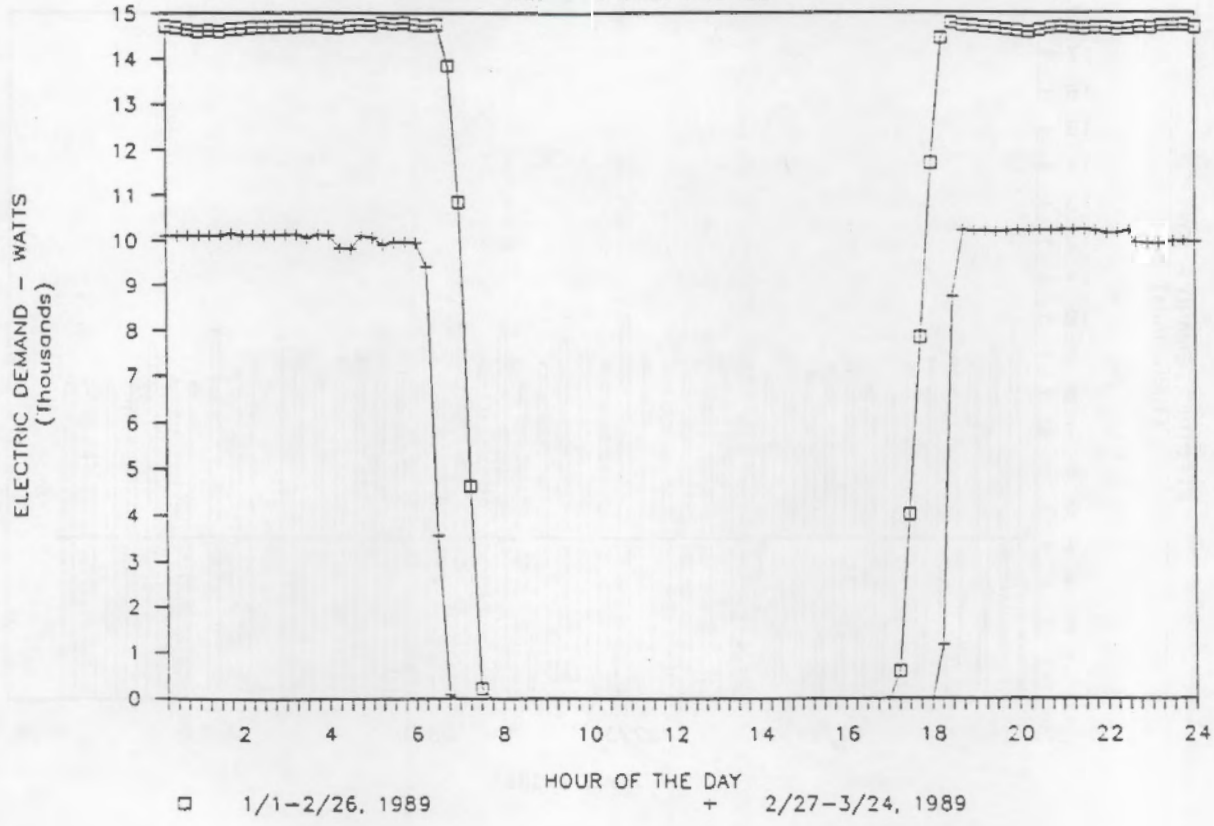
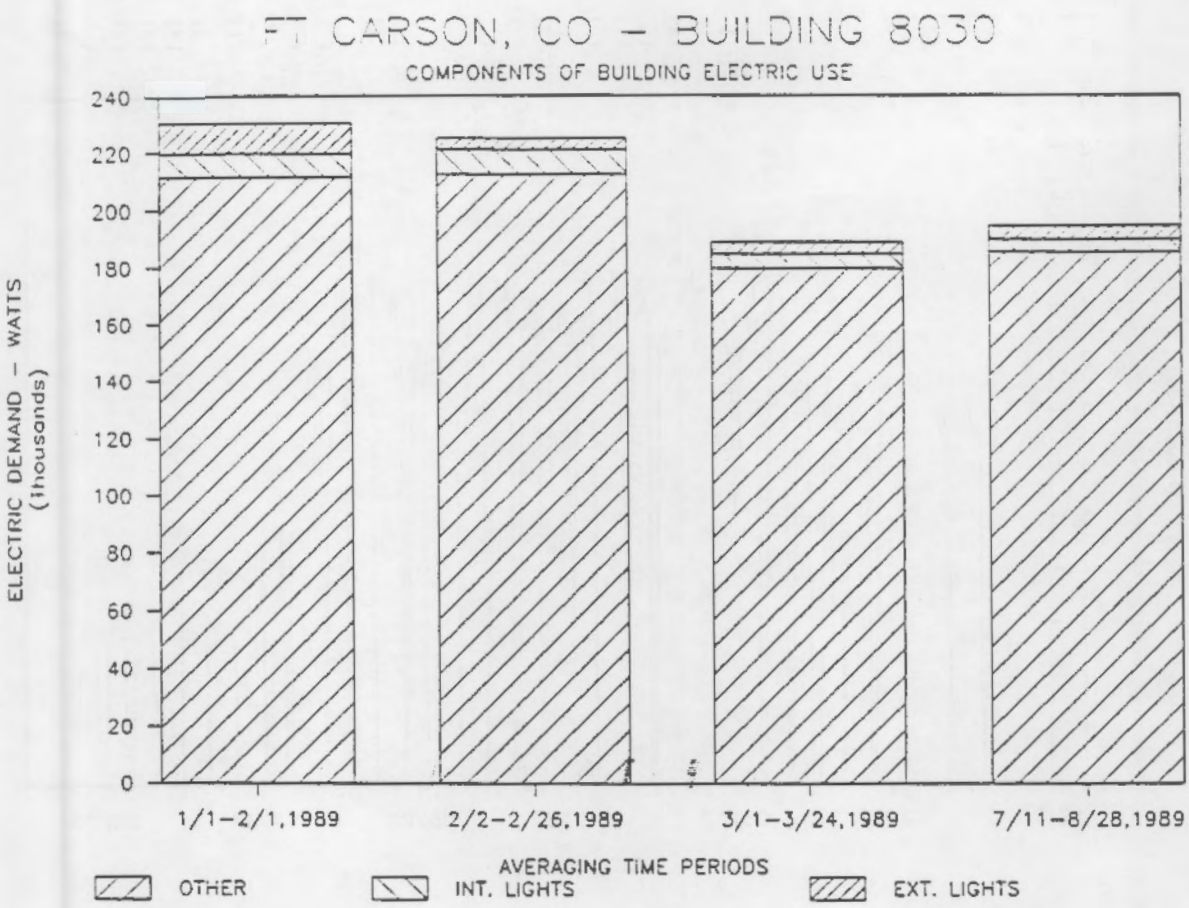
WEEKEND DAILY PROFILE




FT CARSON, CO – BUILDING 8030
COMPONENTS OF BUILDING ELECTRIC USE
ELECTRIC DEMAND – WATTS (thousands)
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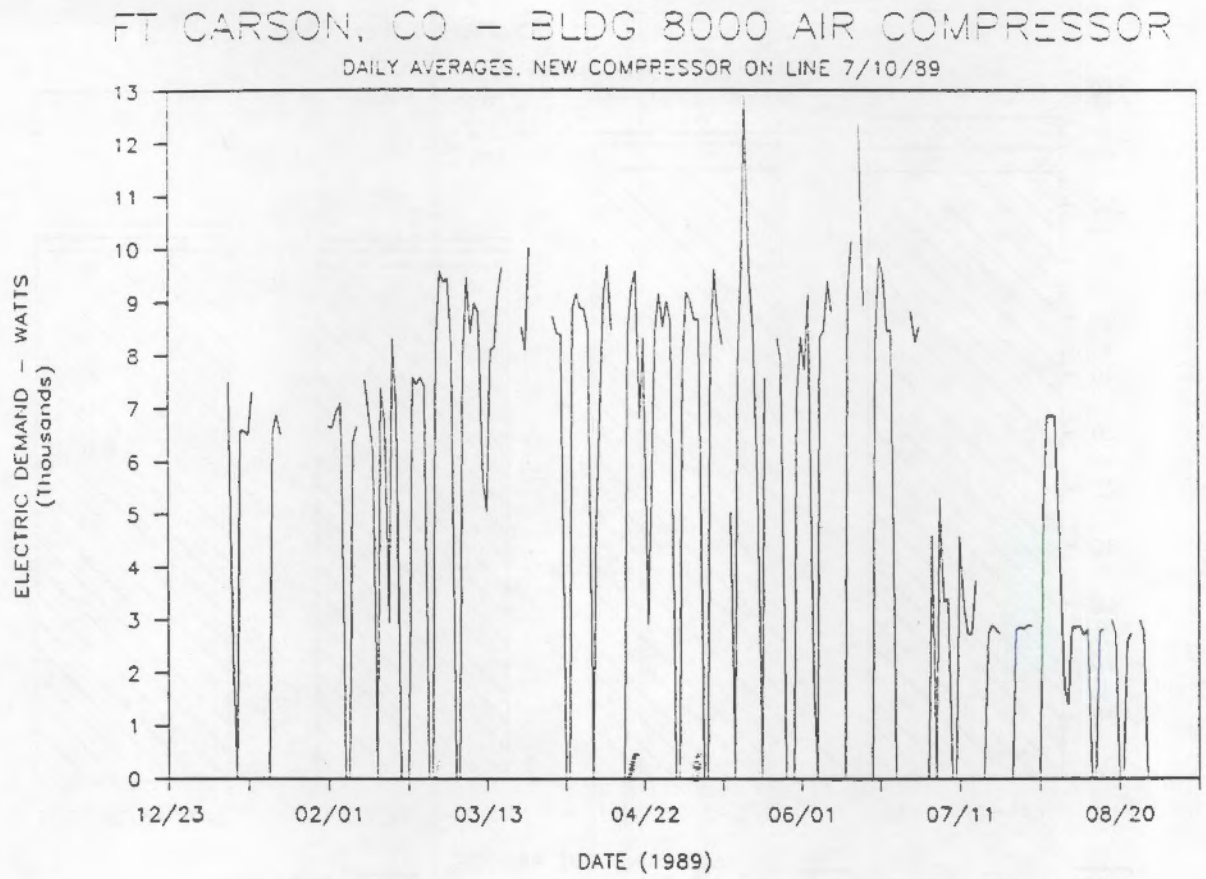
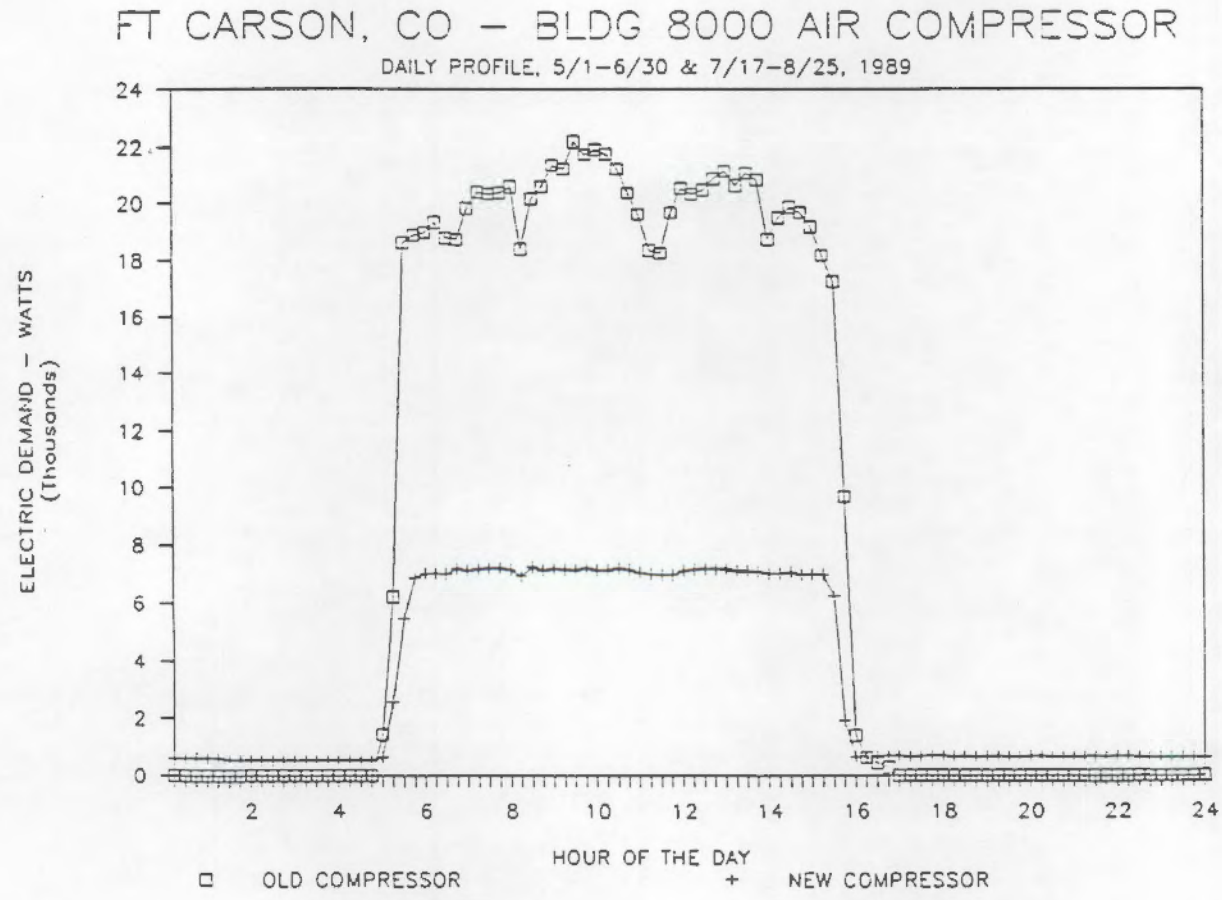
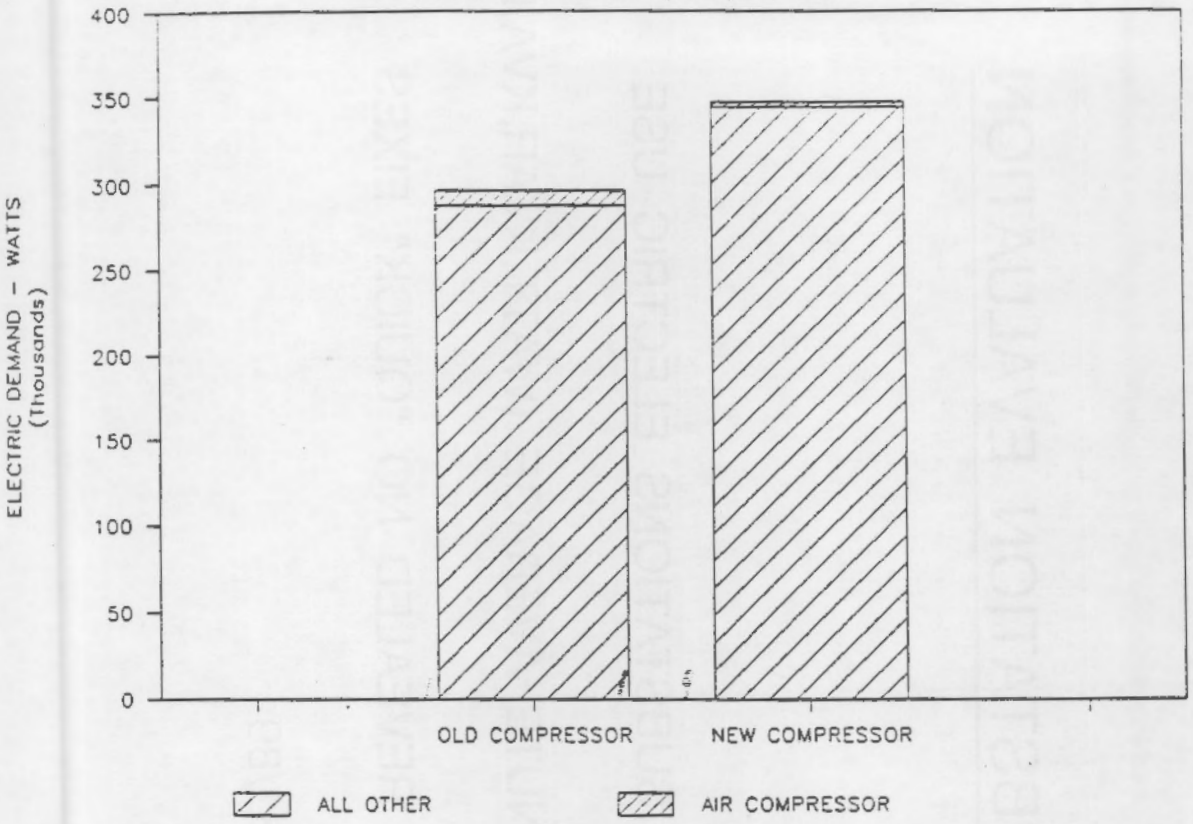
220
200
180
160
140
120
100
80
60
40
20
0
1/1–2/1,1989
2/2–2/26,1989
3/1–3/24,1989
7/11–8/28,1989
AVERAGING TIME PERIODS
OTHER
INT. LIGHTS
EXT. LIGHTS


FT CARSON, CO – BLDG 8000 AIR COMPRESSOR
DAILY AVERAGES, NEW COMPRESSOR ON LINE 7/10/89
ELECTRIC DEMAND – WATTS (Thousands)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
12/23
02/01
03/13
04/22
06/01
07/11
08/20
DATE (1989)


FT CARSON, CO – BLDG 8000 AIR COMPRESSOR
DAILY PROFILE, 5/1–6/30 & 7/17–8/25, 1989
ELECTRIC DEMAND – WATTS (Thousands)
0
2
4
6
8
10
12
14
16
18
20
22
24
2
4
6
8
10
12
14
16
18
20
22
24
HOUR OF THE DAY
□ OLD COMPRESSOR
+ NEW COMPRESSOR

FT CARSON, CO – BLDG 8000 AIR COMPRESSOR

SUMMARY STATISTICS: 5/1–8/20, 1989



FT CARSON: ELEC SUBSTATION EVALUATION

- 3 ELECTRIC SUBSTATIONS
- UTILITY RECORDS TIME-SERIES SUBSTATIONS ELECTRIC USE
- 5-MINUTE DATA, ROLLING 15-MINUTE AVERAGE (WATT,KVAR,KVA,PF)
- DEMAND, PF PROFILE ANALYSIS REVEALED NO "QUICK" FIXES
- TEST COMPLETED: 11/1/89 - 12/31/89

FT CARSON: BLDG 8000/8030 TEMPERATURE SURVEY

- BLDGS 8000/8030 INTERIOR AIR TEMPERATURE SURVEY
- 12 ACR XT-101 PORTABLE TEMPERATURE RECORDERS
- 5-MINUTE DRY BULB AIR TEMPERATURE
- TEMPERATURES > 80 F, HVAC CONTROL SYSTEMS NON-OPERATIONAL
- TEST COMPLETED: 1/12/89 - 1/20/89

FT CARSON: BOILER EFFICIENCY SURVEY

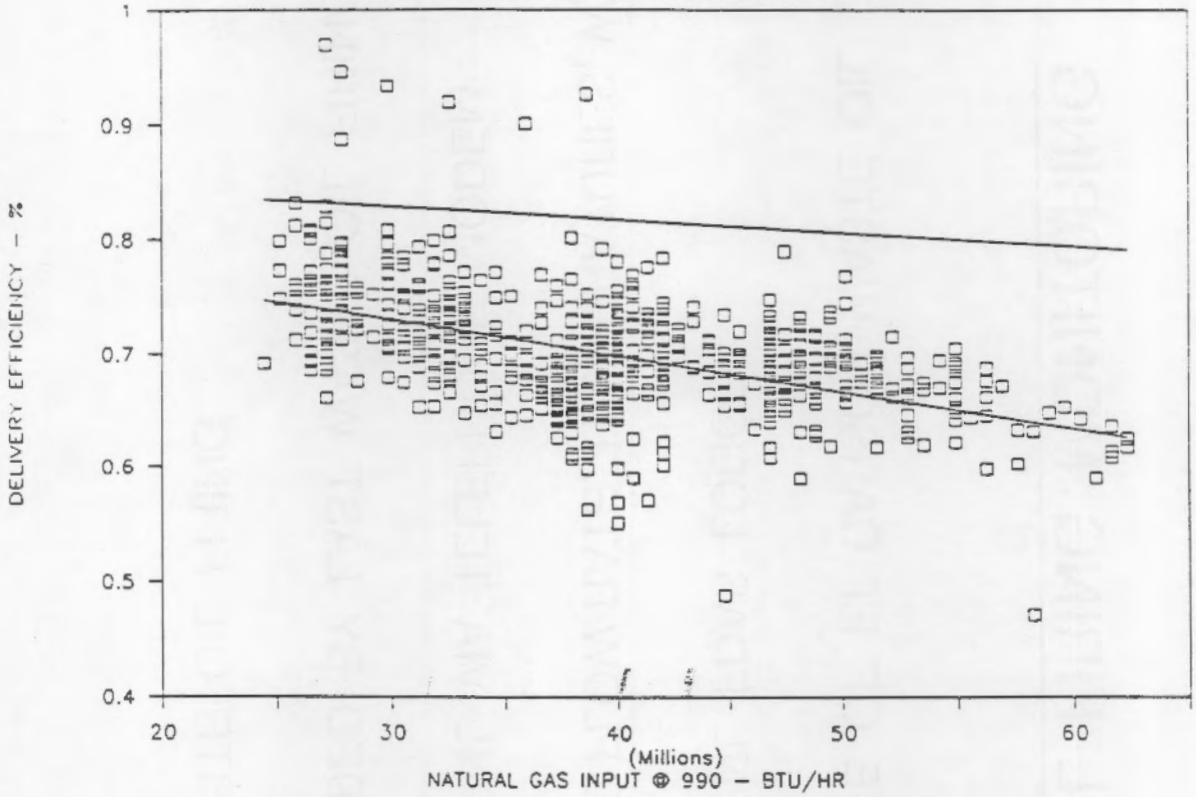
- 4 HEATING PLANTS - 7 BOILERS/HTHW GENERATORS
- BACHARACH COMBUSTION GAS ANALYZER
- CONDUCT FLUE GAS ANALYSIS AT MULTIPLE LOADS
- GENERAL OPERATING EFFICIENCIES RANGED: 78.2% - 84.5%
- TEST COMPLETED: 3/20/89 - 3/23/89

FT CARSON: WASTE OIL FIRING MONITORING

- 1 BOILER SELECTED TO DISPOSE OF FT CARSON WASTE OIL
- EMCO 3270 FLOW METER AND PNL FDAS LOGGER
- 15-MINUTE DATA (HTHW AND GAS FLOW RATE, TEMPERATURES, WATT)
- DATA COLLECTED NIGHTLY BY PNL VIA TELEPHONE MODEM
- BOILER EFF CURRENTLY DEGRADED BY LAST WASTE OIL FIRING
- TEST PERIOD: 3/22/89 - NEXT WASTE OIL FIRING

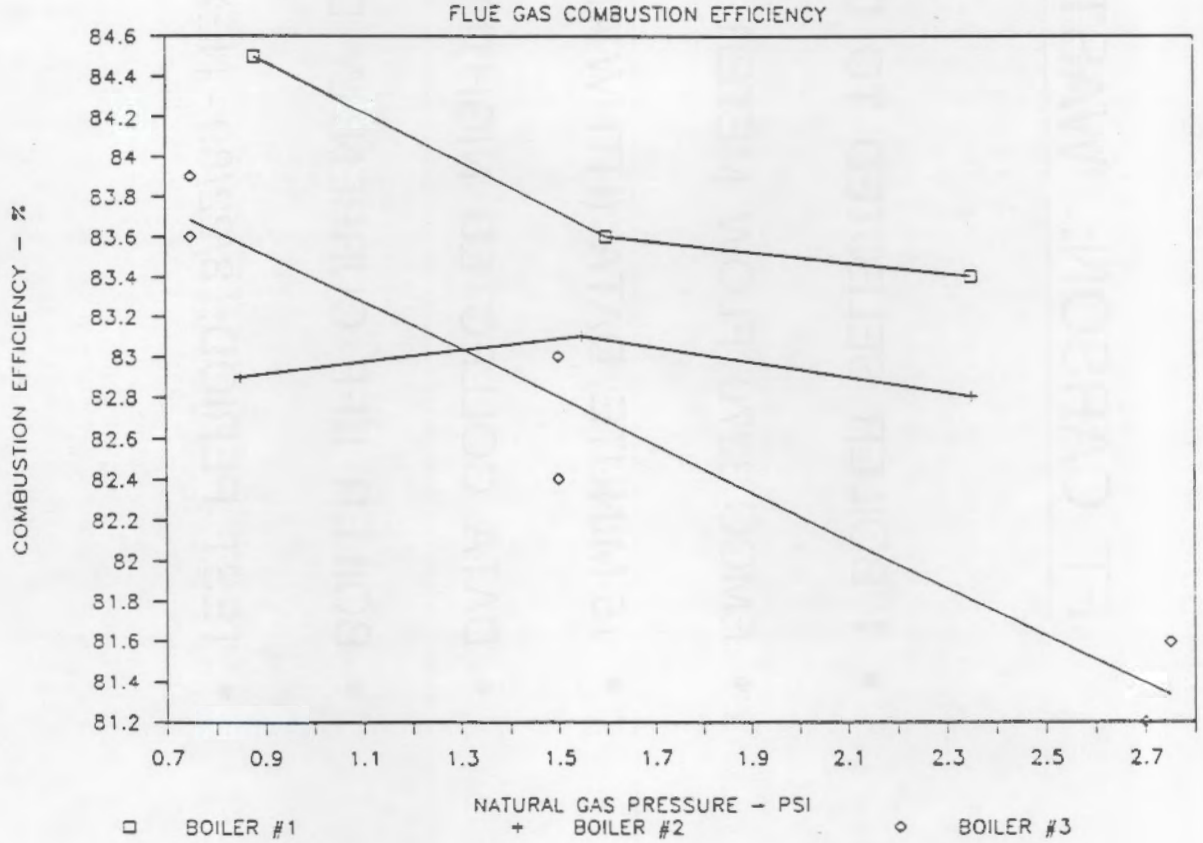
FT CARSON, CO – BLDG 1860, BOILER #3

NATURAL GAS FUEL ONLY, 3/24–4/21, 1989



FT CARSON, CO – BLDG 1860

FLUE GAS COMBUSTION EFFICIENCY

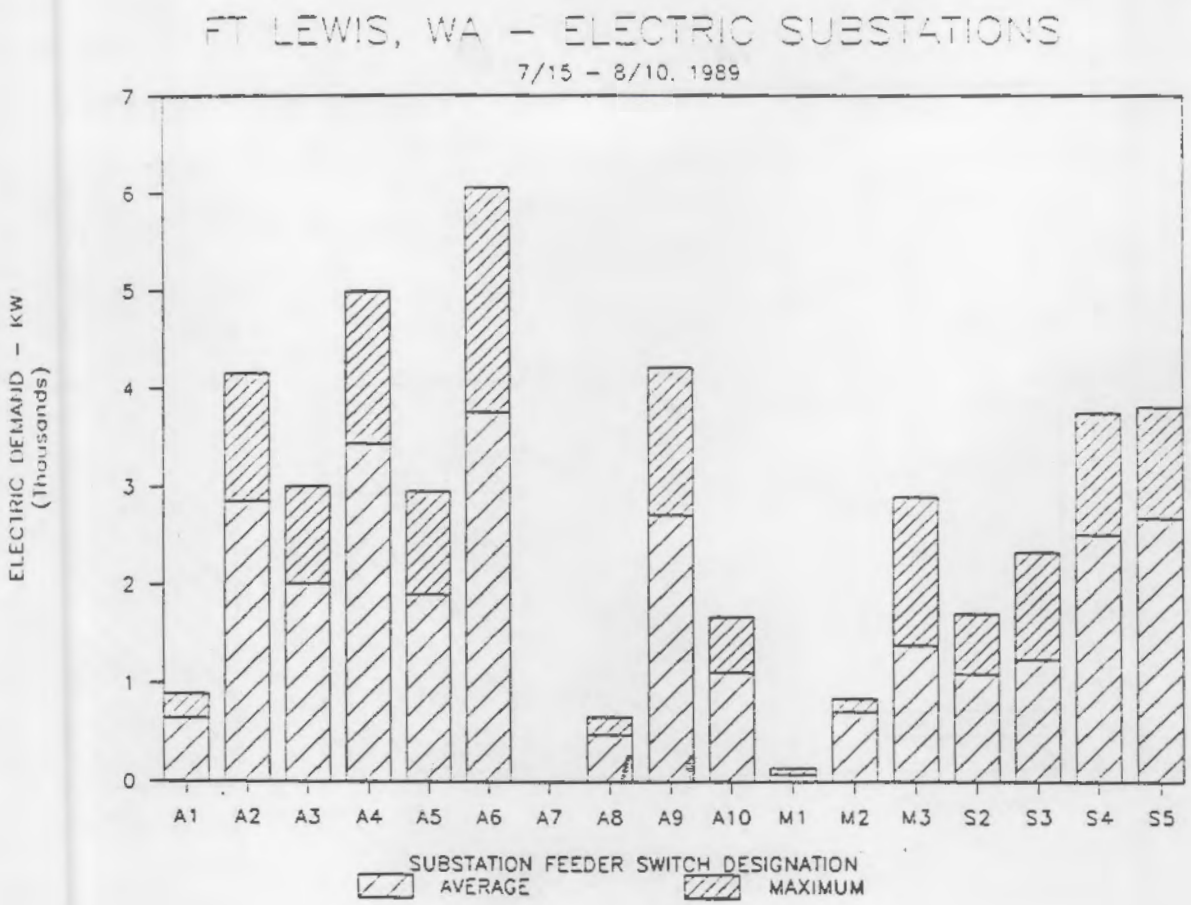


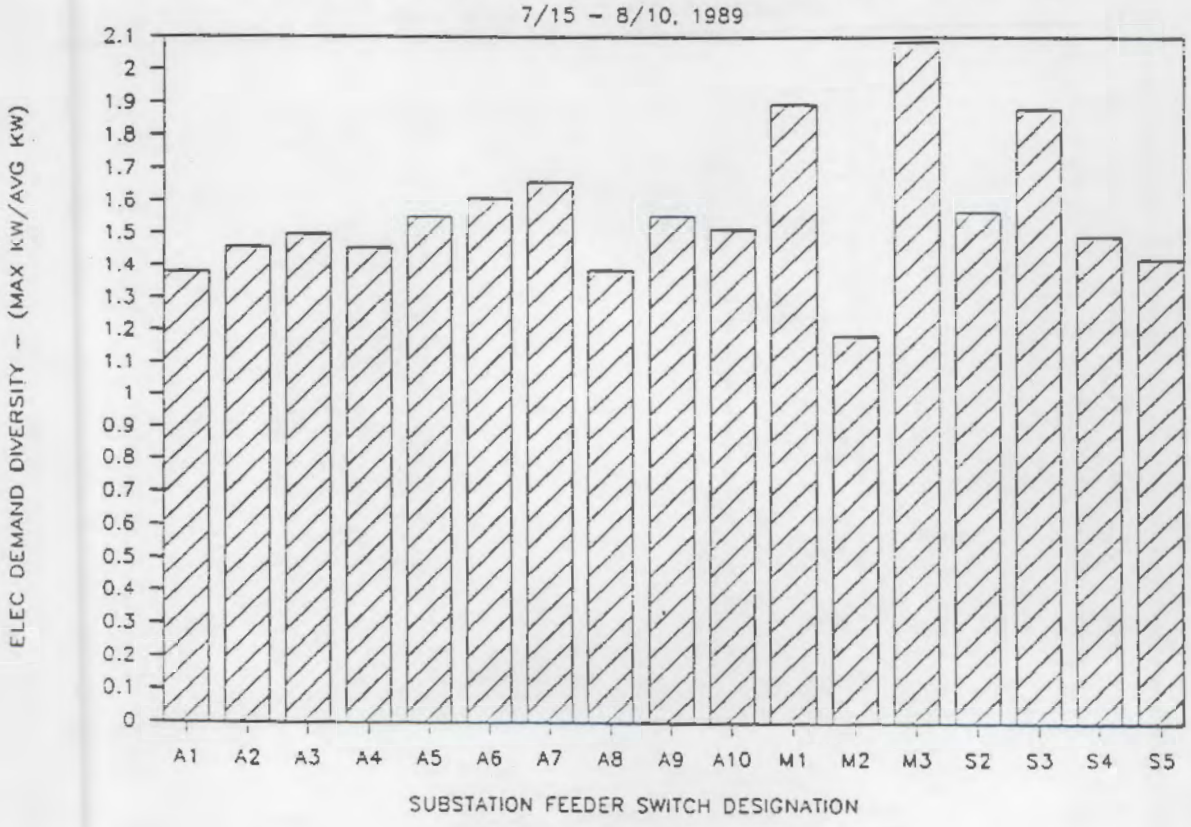
FORT LEWIS, WA - MAP

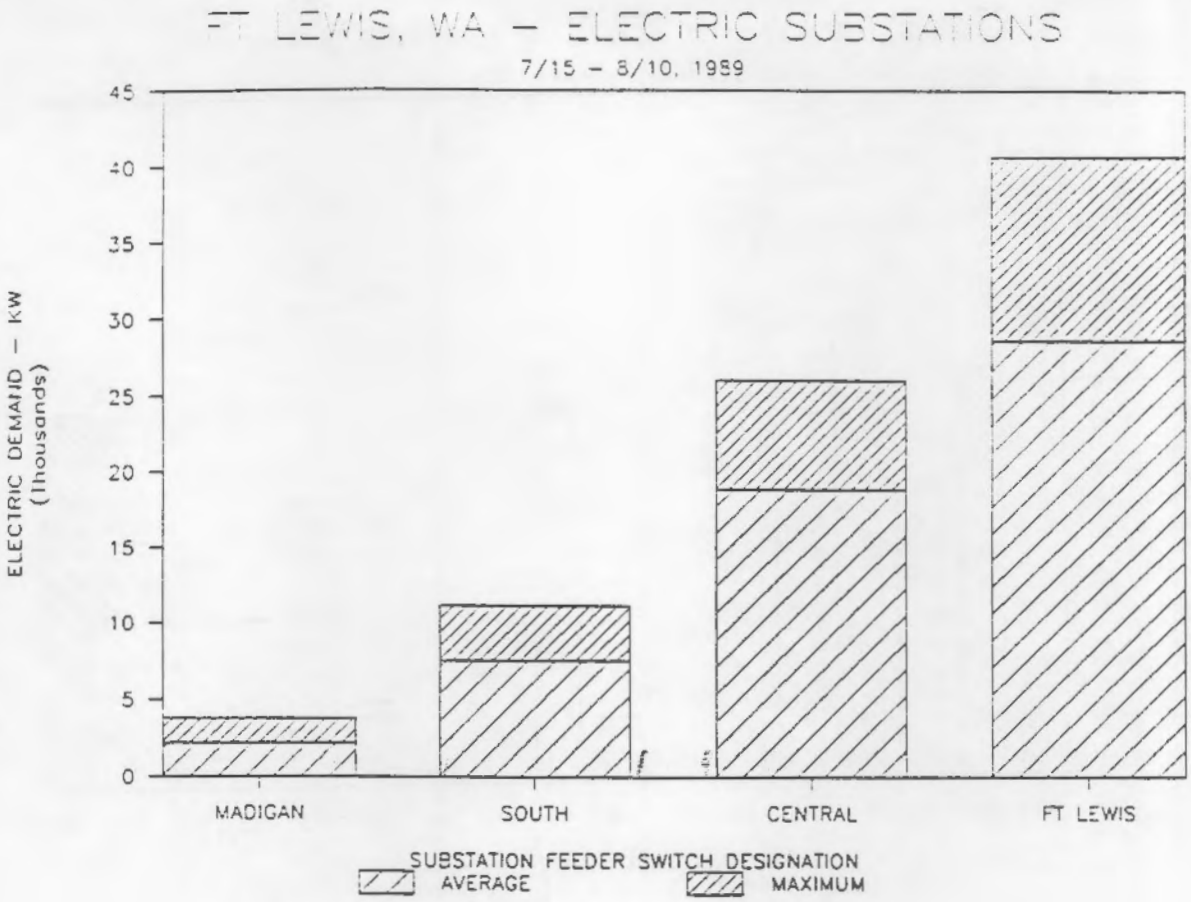
- MAIN SUBSTATION/FEEDER ELECTRIC DEMAND PROFILES
- SEWAGE TREATMENT PLANT/EFFLUENT PUMP POWER QUALITY
- COMMISSARY ELECTRIC USE COMPARISON TO COMMERCIAL
- STEAM/HTHW PLANTS BTU COMPARED TO EXISTING EQUIPMENT
- TYPICAL BARRACKS STEAM/HTHW USE PROFILE
- HELICOPTER SIMULATOR BUILDING POWER QUALITY

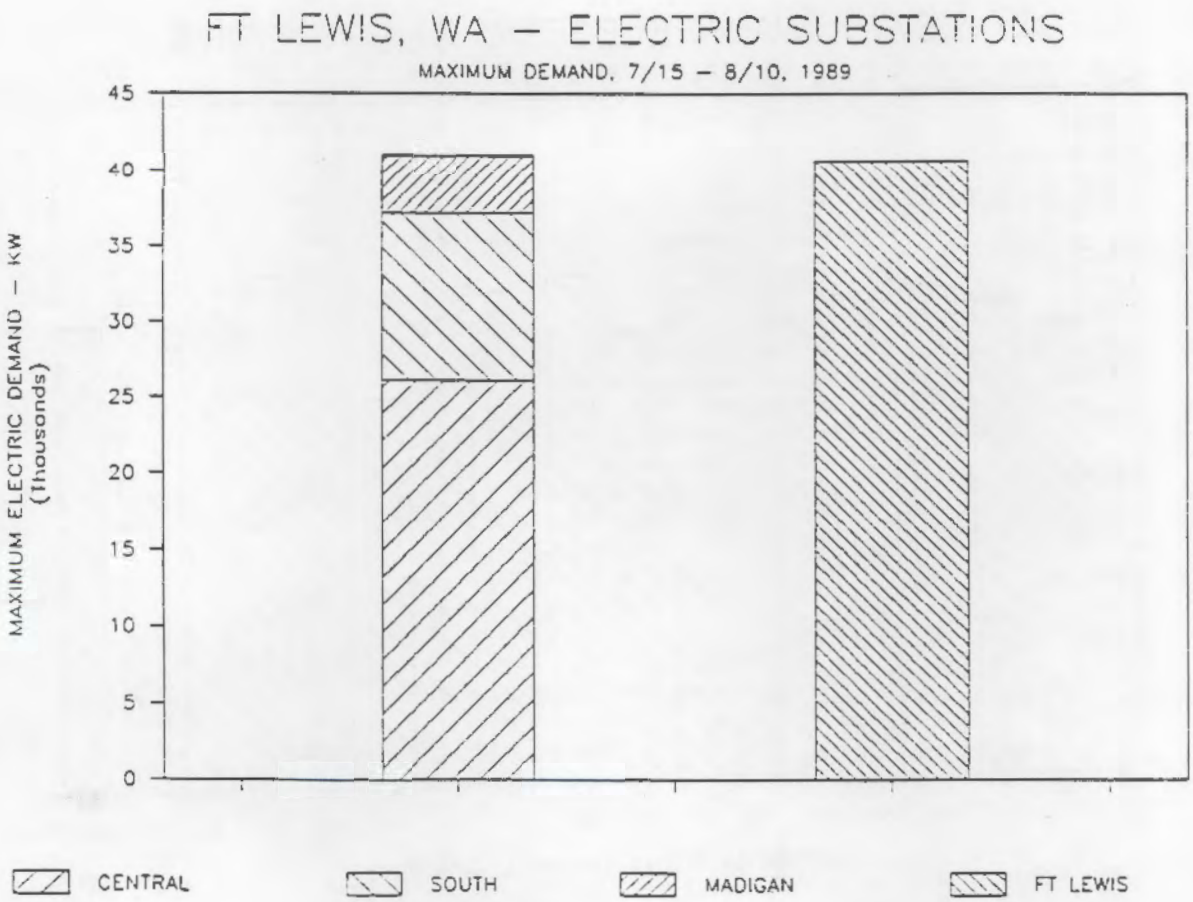
FT LEWIS: ELECTRIC SUBSTATION MONITORING

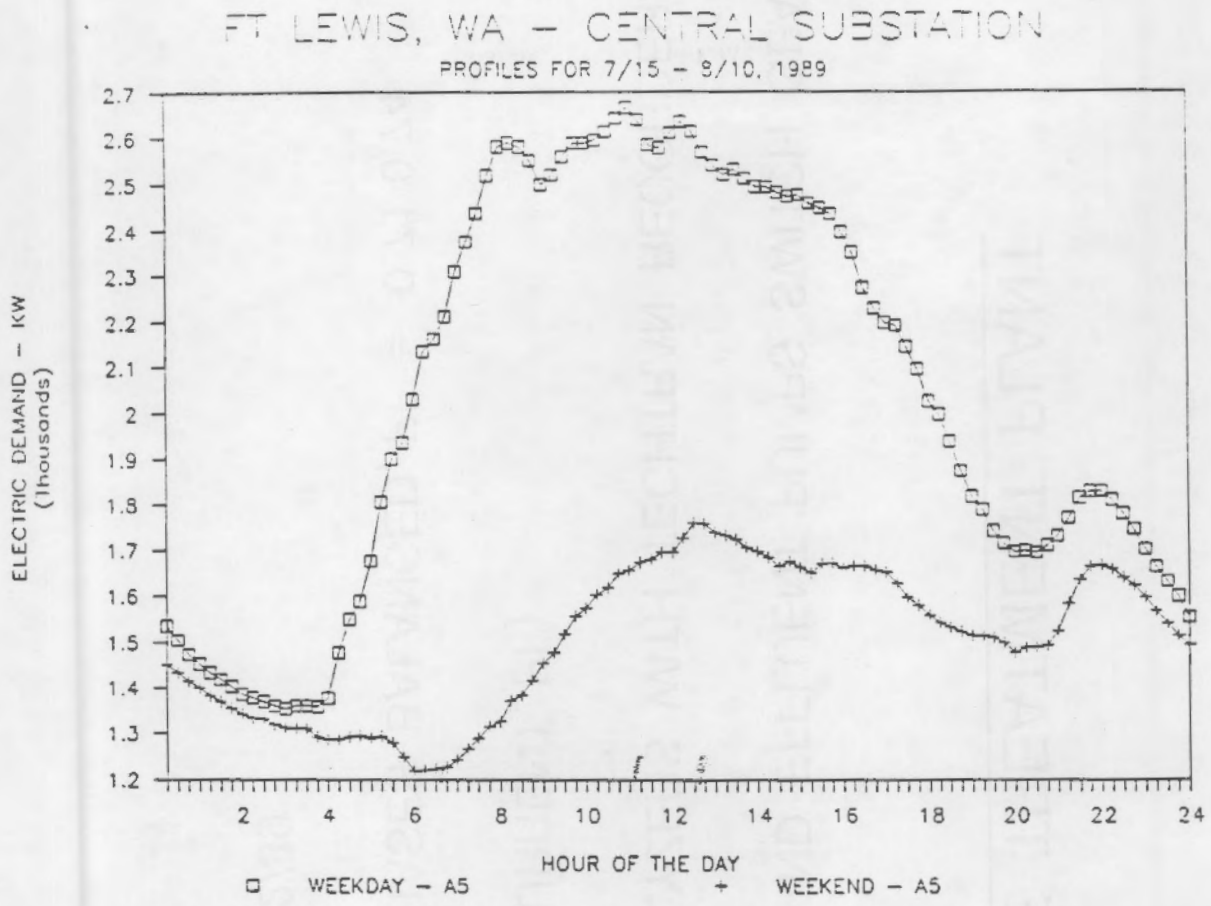
- 3 ELECTRIC SUBSTATIONS, 17 FEEDER LINES
- 4 SYNERGISTIC CONTROL SYSTEMS C180 DATA LOGGERS
- 15-MINUTE DATA (WATT, VOLT, PF, AIR TEMPERATURE)
- DATA COLLECTED WEEKLY BY DEH PERSONNEL
- MAXIMUM DEMAND AND TYPICAL PROFILES BEING DEVELOPED
- TEST PERIOD: 7/12/89 - DEH REQUEST/EQUIPMENT NEED

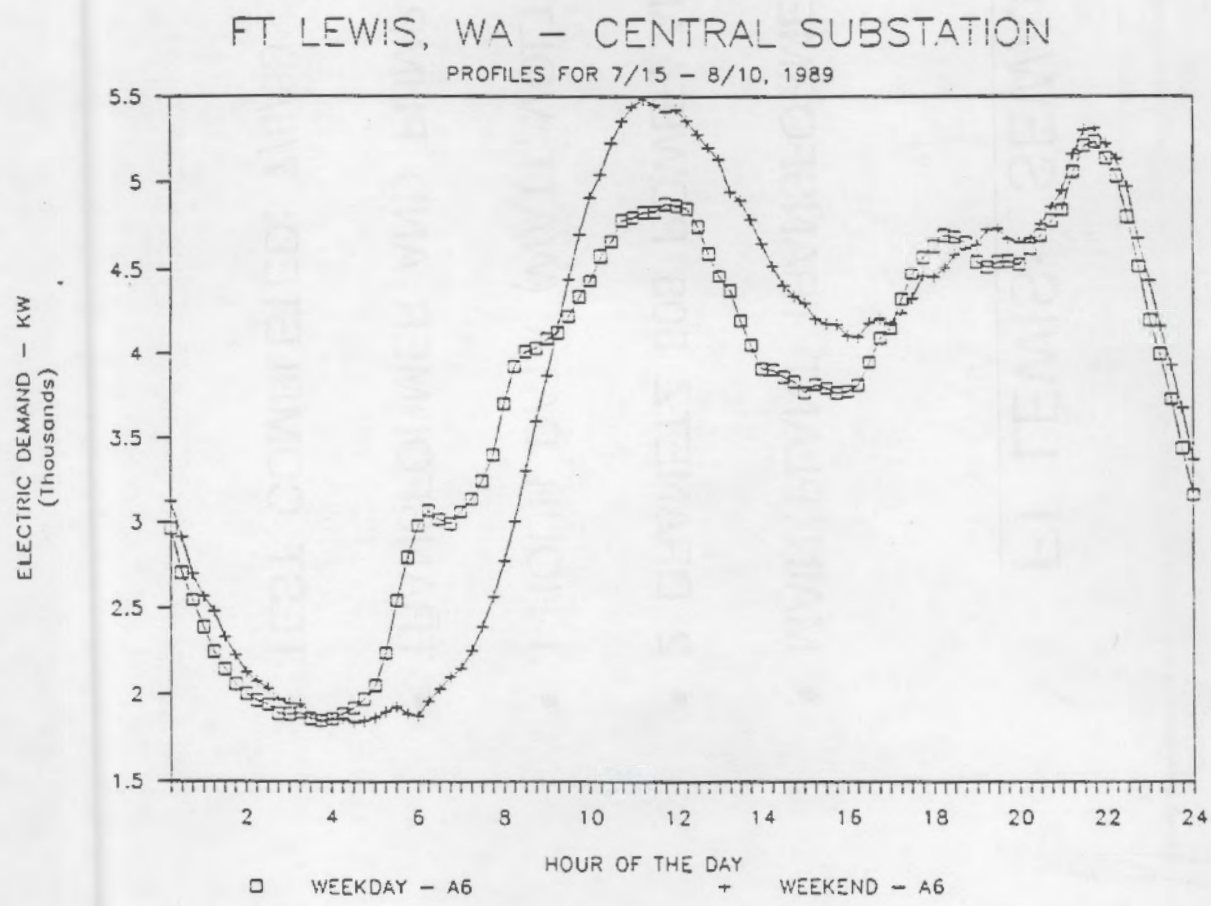

FT LEWIS, WA – ELECTRIC SUBSTATIONS
7/15 – 8/10, 1989
ELECTRIC DEMAND – KW
(Thousands)
0
1
2
3
4
5
6
7
A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 M1 M2 M3 S2 S3 S4 S5
SUBSTATION FEEDER SWITCH DESIGNATION
AVERAGE
MAXIMUM


FT LEWIS, WA – ELECTRIC SUBSTATIONS
7/15 – 8/10, 1989
ELEC DEMAND DIVERSITY – (MAX KW/AVG KW)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
2.1
A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 M1 M2 M3 S2 S3 S4 S5
SUBSTATION FEEDER SWITCH DESIGNATION


FT LEWIS, WA – ELECTRIC SUBSTATIONS
7/15 – 8/10, 1989
ELECTRIC DEMAND – KW
(Thousands)
45
40
35
30
25
20
15
10
5
0
MADIGAN
SOUTH
CENTRAL
FT LEWIS
SUBSTATION FEEDER SWITCH DESIGNATION
AVERAGE
MAXIMUM


FT LEWIS, WA – ELECTRIC SUBSTATIONS
MAXIMUM DEMAND, 7/15 – 8/10, 1989
MAXIMUM ELECTRIC DEMAND – KW
(Thousands)
45
40
35
30
25
20
15
10
5
0
CENTRAL
SOUTH
MADIGAN
FT LEWIS


FT LEWIS, WA – CENTRAL SUBSTATION
PROFILES FOR 7/15 – 8/10, 1989
ELECTRIC DEMAND – KW
(Thousands)
2.7
2.6
2.5
2.4
2.3
2.2
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
2
4
6
8
10
12
14
16
18
20
22
24
HOUR OF THE DAY
WEEKDAY – A5
WEEKEND – A5

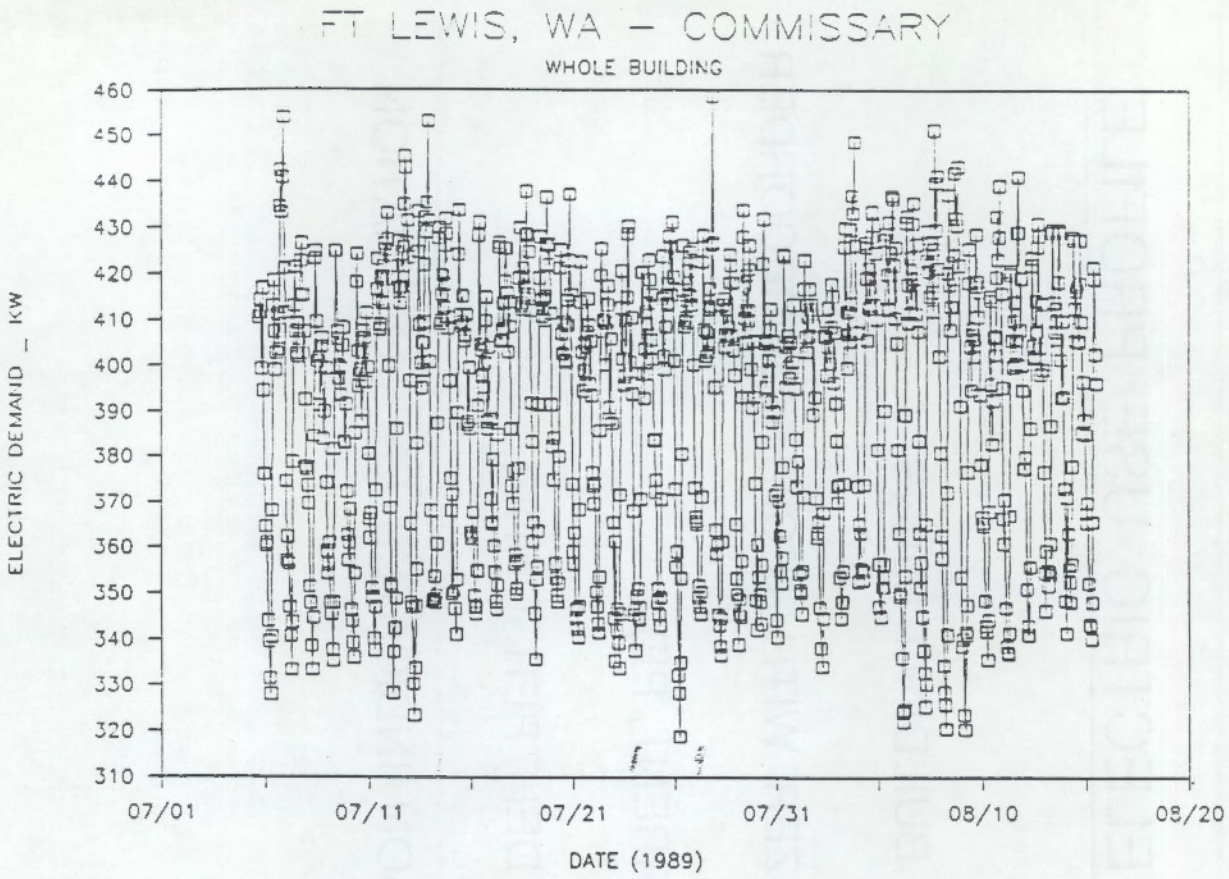

FT LEWIS, WA – CENTRAL SUBSTATION
PROFILES FOR 7/15 – 8/10, 1989
ELECTRIC DEMAND – KW
(Thousands)
5.5
5
4.5
4
3.5
3
2.5
2
1.5
2
4
6
8
10
12
14
16
18
20
22
24
HOUR OF THE DAY
WEEKDAY – A6
WEEKEND – A6

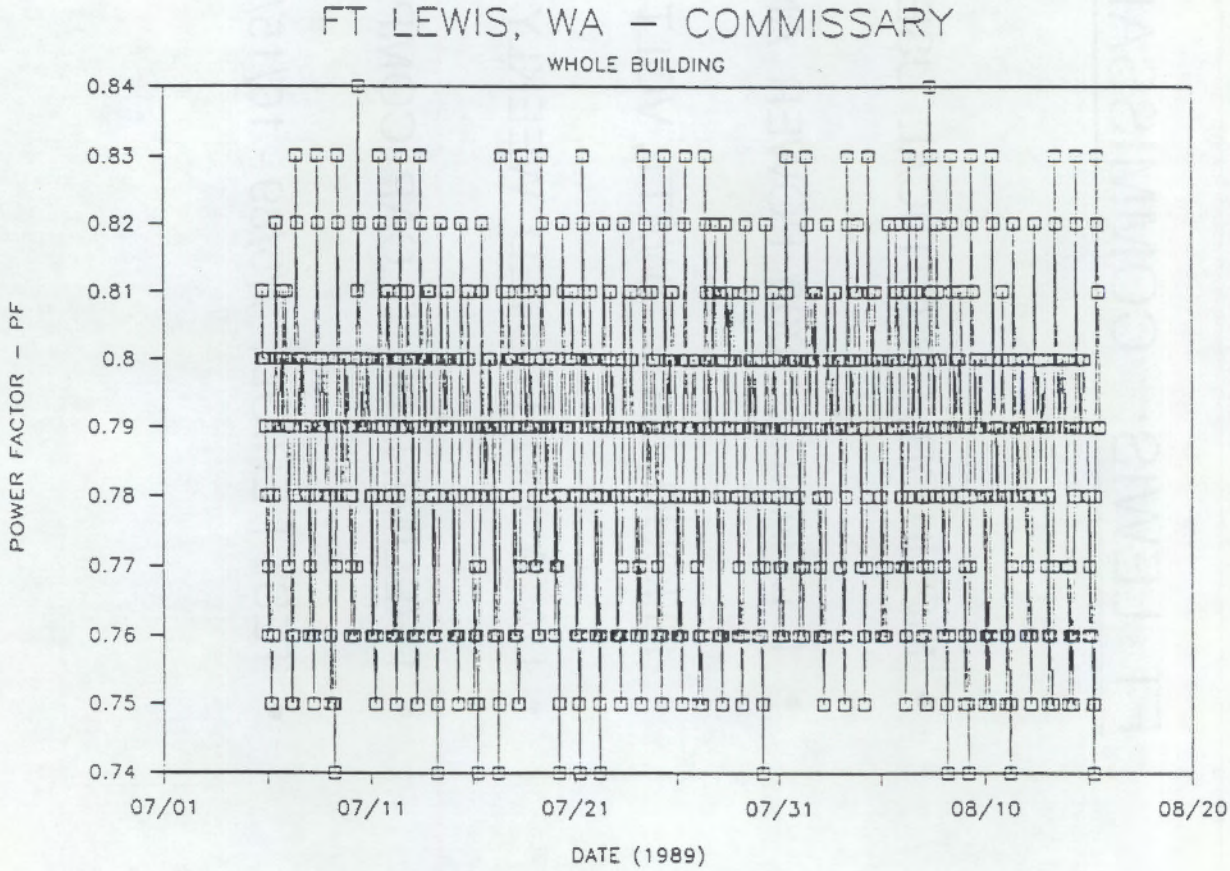
FT LEWIS: SEWAGE TREATMENT PLANT

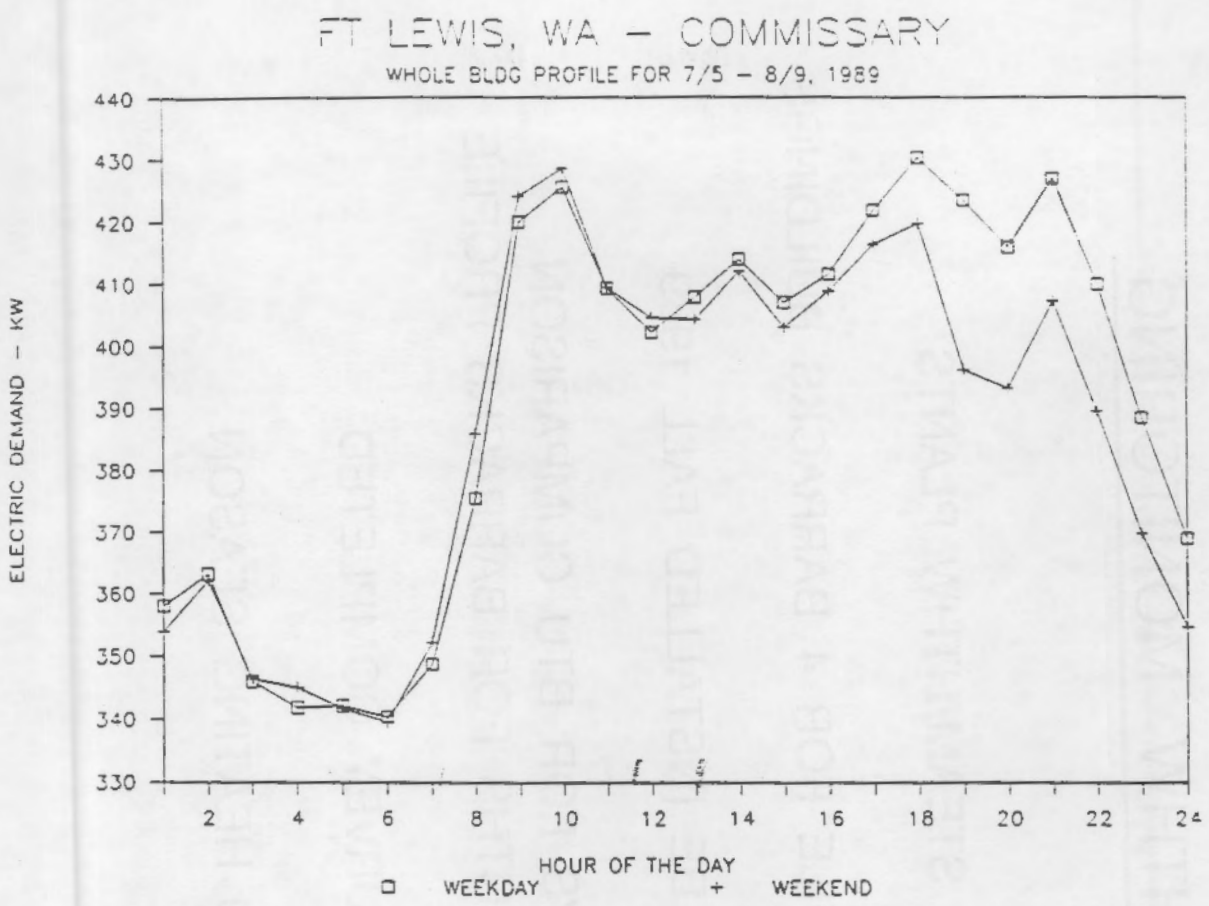
- MAIN PLANT TRANSFORMER AND EFFLUENT PUMPS SWITCH GEAR
- 2 DRANETZ 808 POWER ANALYZERS WITH TECHTRAN RECORDERS
- 1-HOUR DATA (WATT, VOLT, CURRENT, PF)
- TRANSFORMER AND PUMP PHASES BALANCED, PF = 0.71-0.74
- TEST COMPLETED: 7/5/89 - 7/12/89

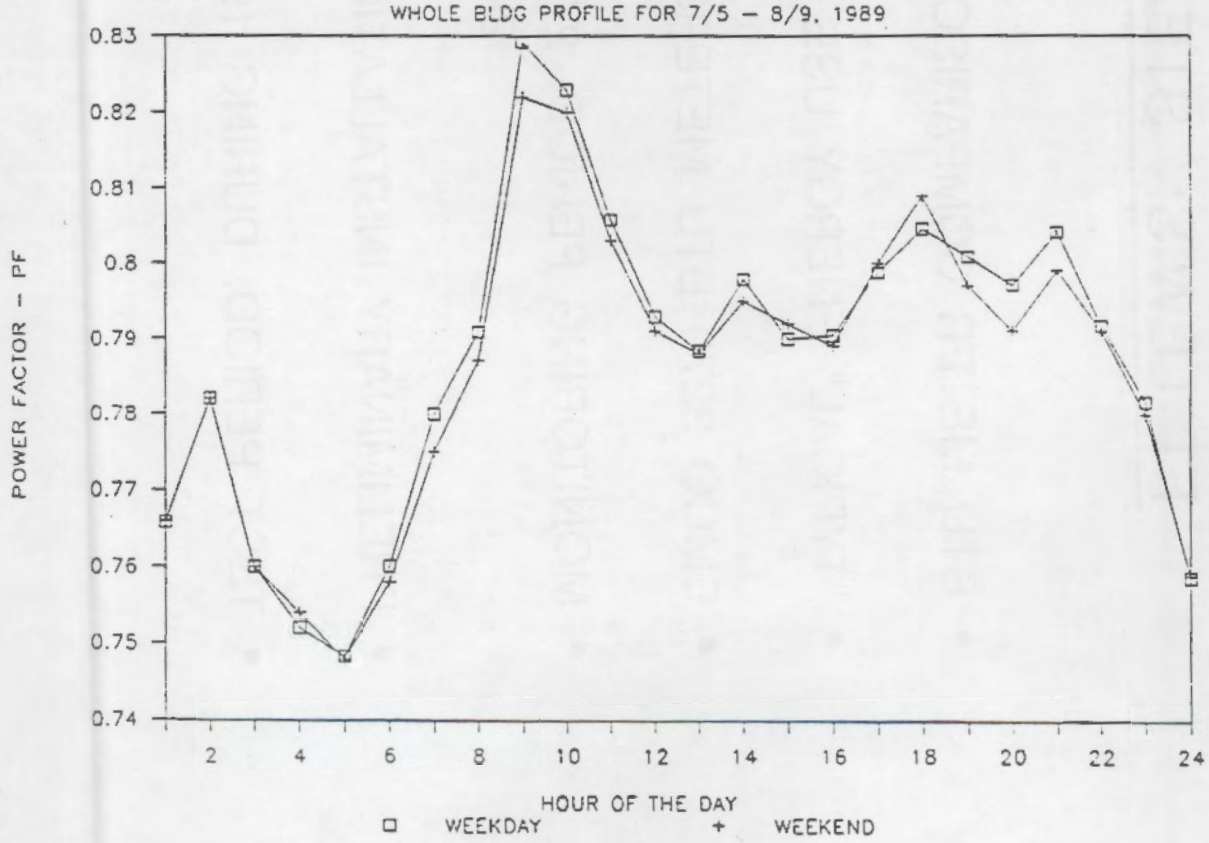
FT LEWIS: COMMISSARY ELECTRIC USE PROFILE

- MONITOR ELECTRICAL USE AT BUILDING MAINS
- 1 DRANETZ 808 POWER ANALYZER WITH TECHTRAN RECORDER
- 1-HOUR DATA (WATT, VOLT, CURRENT, PF)
- DATA COLLECTED WEEKLY BY DEH PERSONNEL
- PRELIMINARY ELCAP COMPARISON INDICATES EFF. OPERATION
- TEST PERIOD: 7/5/89 - 10/15/89


FT LEWIS, WA – COMMISSARY
WHOLE BUILDING
ELECTRIC DEMAND – KW
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310
07/01
07/11
07/21
07/31
08/10
08/20
DATE (1989)


FT LEWIS, WA – COMMISSARY
WHOLE BUILDING
POWER FACTOR – PF
0.84
0.83
0.82
0.81
0.8
0.79
0.78
0.77
0.76
0.75
0.74
07/01
07/11
07/21
07/31
08/10
08/20
DATE (1989)


FT LEWIS, WA – COMMISSARY
WHOLE BLDG PROFILE FOR 7/5 – 8/9, 1989
ELECTRIC DEMAND – KW
440
430
420
410
400
390
380
370
360
350
340
330
2
4
6
8
10
12
14
16
18
20
22
24
HOUR OF THE DAY
WEEKDAY
WEEKEND

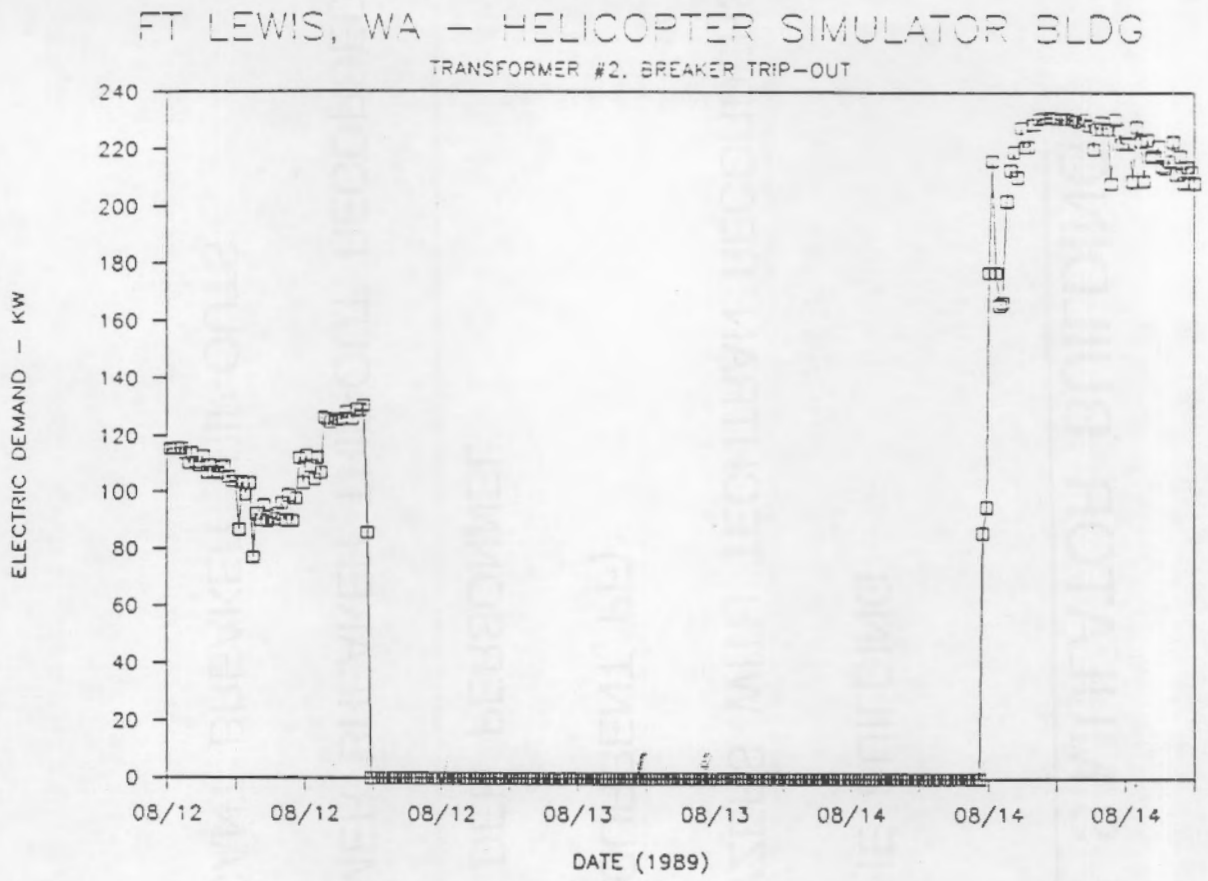

FT LEWIS, WA – COMMISSARY
WHOLE BLDG PROFILE FOR 7/5 – 8/9, 1989
POWER FACTOR – PF
0.83
0.82
0.81
0.8
0.79
0.78
0.77
0.76
0.75
0.74
2
4
6
8
10
12
14
16
18
20
22
24
HOUR OF THE DAY
WEEKDAY
WEEKEND

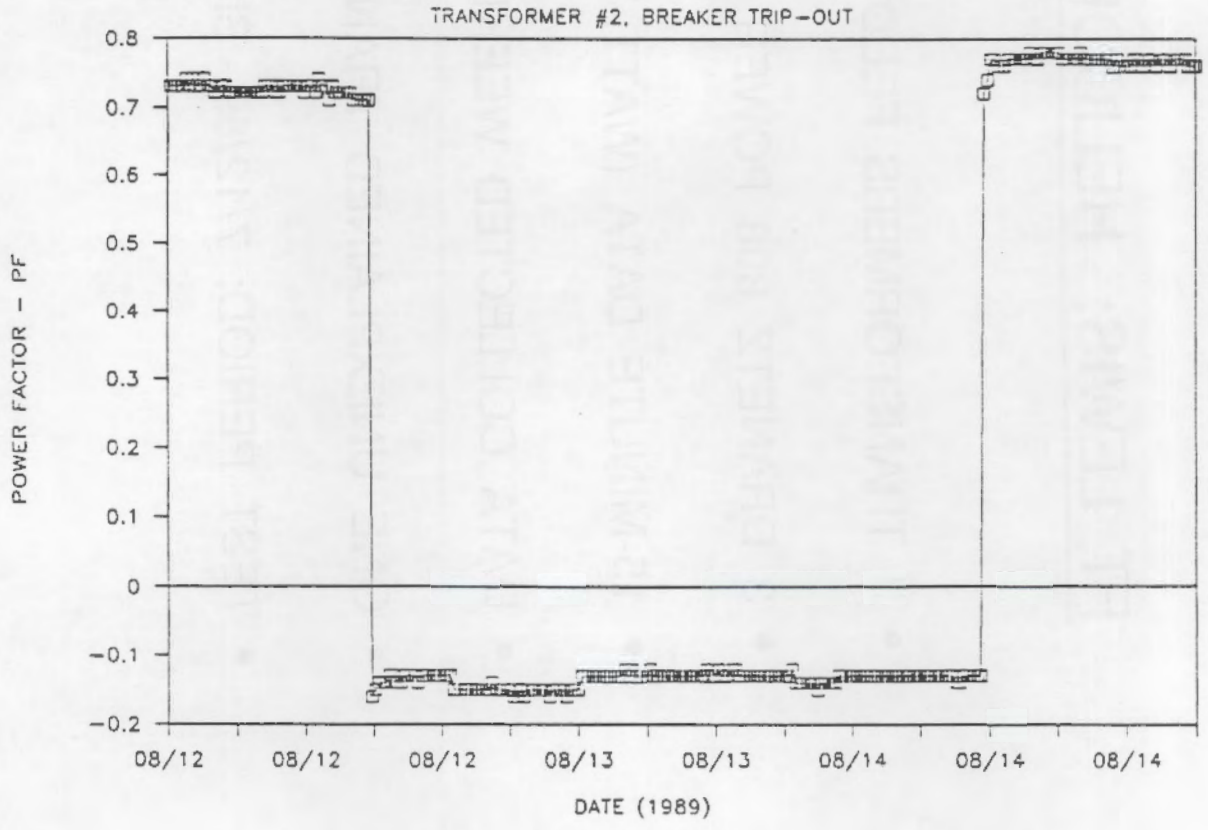
FT LEWIS: STEAM/HTHW MONITORING

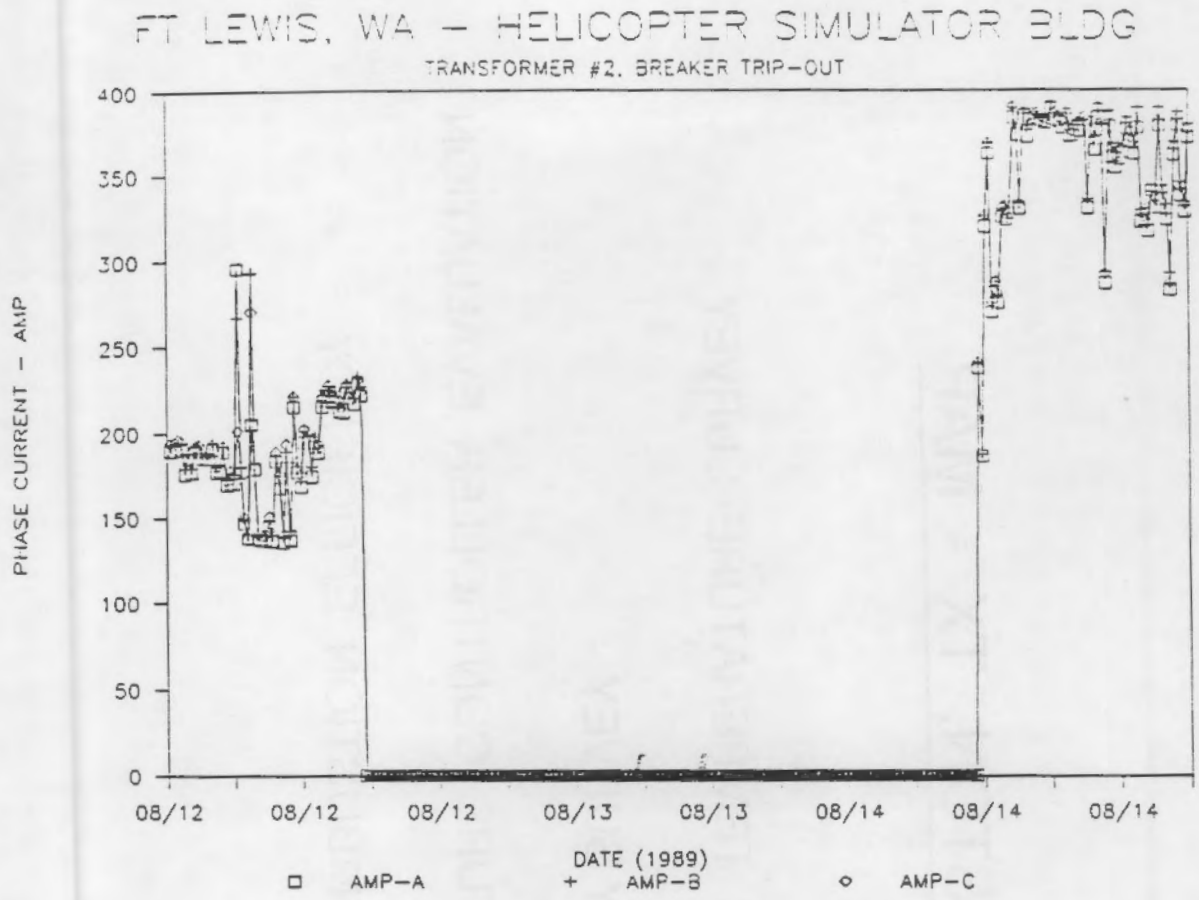
- BTU METER COMPARISON AT STEAM/HTHW PLANTS
- "TYPICAL" ENERGY USE PROFILE FOR 4 BARRACKS BUILDINGS
- EMCO 3270 BTU METERS TO BE INSTALLED FALL 1989
- MONITORING PERIOD: 2-7 DAYS FOR BTU COMPARISON
  2-3 MONTHS FOR BARRACKS PROFILE
- PRELIMINARY INSTALLATION SURVEY COMPLETED
- TEST PERIOD: DURING 1989-99 HEATING SEASON

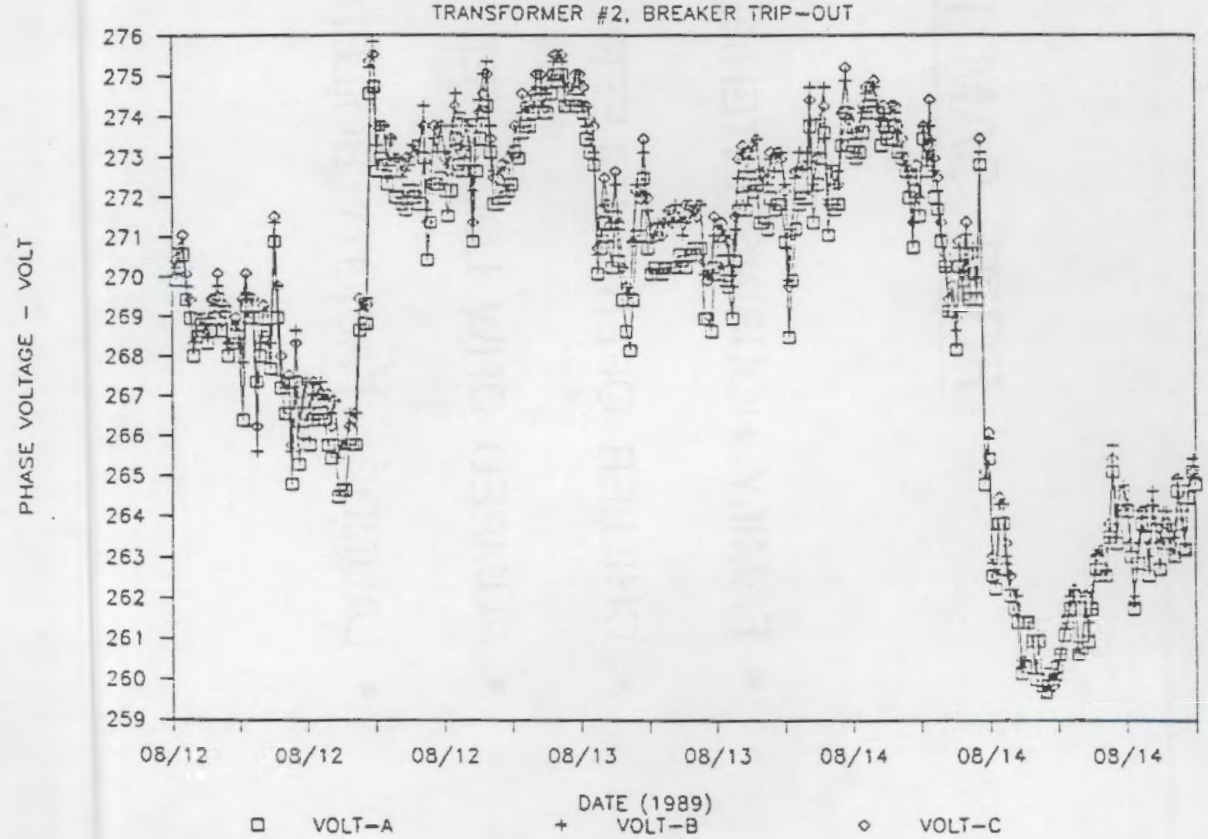
FT LEWIS: HELICOPTER SIMULATOR BUILDING

- 3 TRANSFORMERS FEEDING THE BUILDING
- 3 DRANETZ 808 POWER ANALYZERS WITH TECHTRAN RECORDERS
- 15-MINUTE DATA (WATT, VOLT, CURRENT, PF)
- DATA COLLECTED WEEKLY BY DEH PERSONNEL
- ONE UNEXPLAINED TRANSFORMER BREAKER TRIP-OUT RECORDED
- TEST PERIOD: 7/12/89 - SIGNIFICANT BREAKER TRIP-OUTS


FT LEWIS, WA – HELICOPTER SIMULATOR BLDG
TRANSFORMER #2, BREAKER TRIP–OUT
ELECTRIC DEMAND – KW
240
220
200
180
160
140
120
100
80
60
40
20
0
08/12
08/12
08/12
08/13
08/13
08/14
08/14
08/14
DATE (1989)


FT LEWIS, WA – HELICOPTER SIMULATOR BLDG
TRANSFORMER #2, BREAKER TRIP–OUT
POWER FACTOR – PF
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
–0.1
–0.2
08/12
08/12
08/12
08/13
08/13
08/14
08/14
08/14
DATE (1989)


FT LEWIS, WA – HELICOPTER SIMULATOR BLDG
TRANSFORMER #2, BREAKER TRIP-OUT
PHASE CURRENT – AMP
400
350
300
250
200
150
100
50
0
08/12
08/12
08/12
08/13
08/13
08/14
08/14
08/14
DATE (1989)
AMP-A
AMP-B
AMP-C

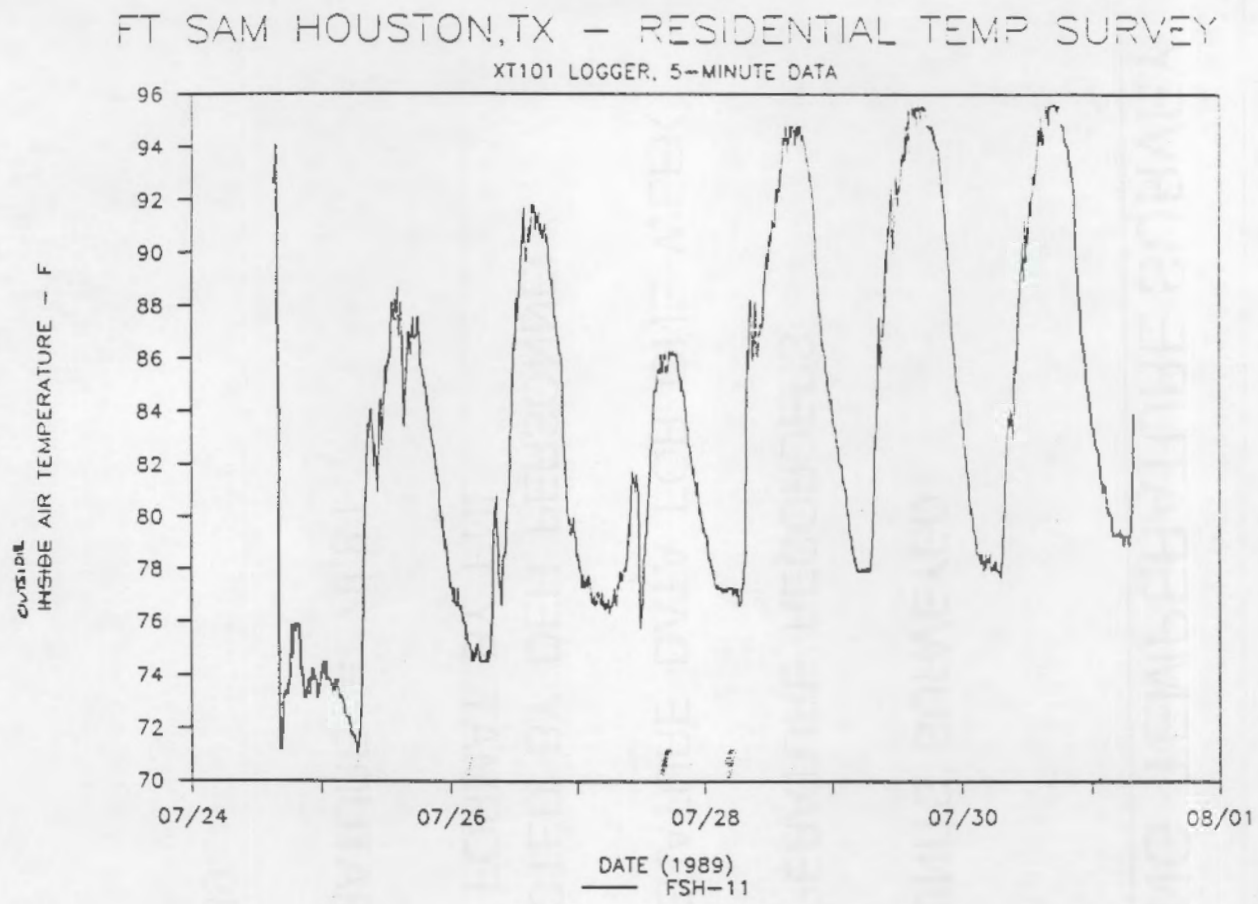

FT LEWIS, WA – HELICOPTER SIMULATOR BLDG
TRANSFORMER #2, BREAKER TRIP-OUT
PHASE VOLTAGE – VOLT
276
275
274
273
272
271
270
269
268
267
266
265
264
263
262
261
260
259
08/12
08/12
08/12
08/13
08/13
08/14
08/14
08/14
DATE (1989)
VOLT-A
VOLT-B
VOLT-C

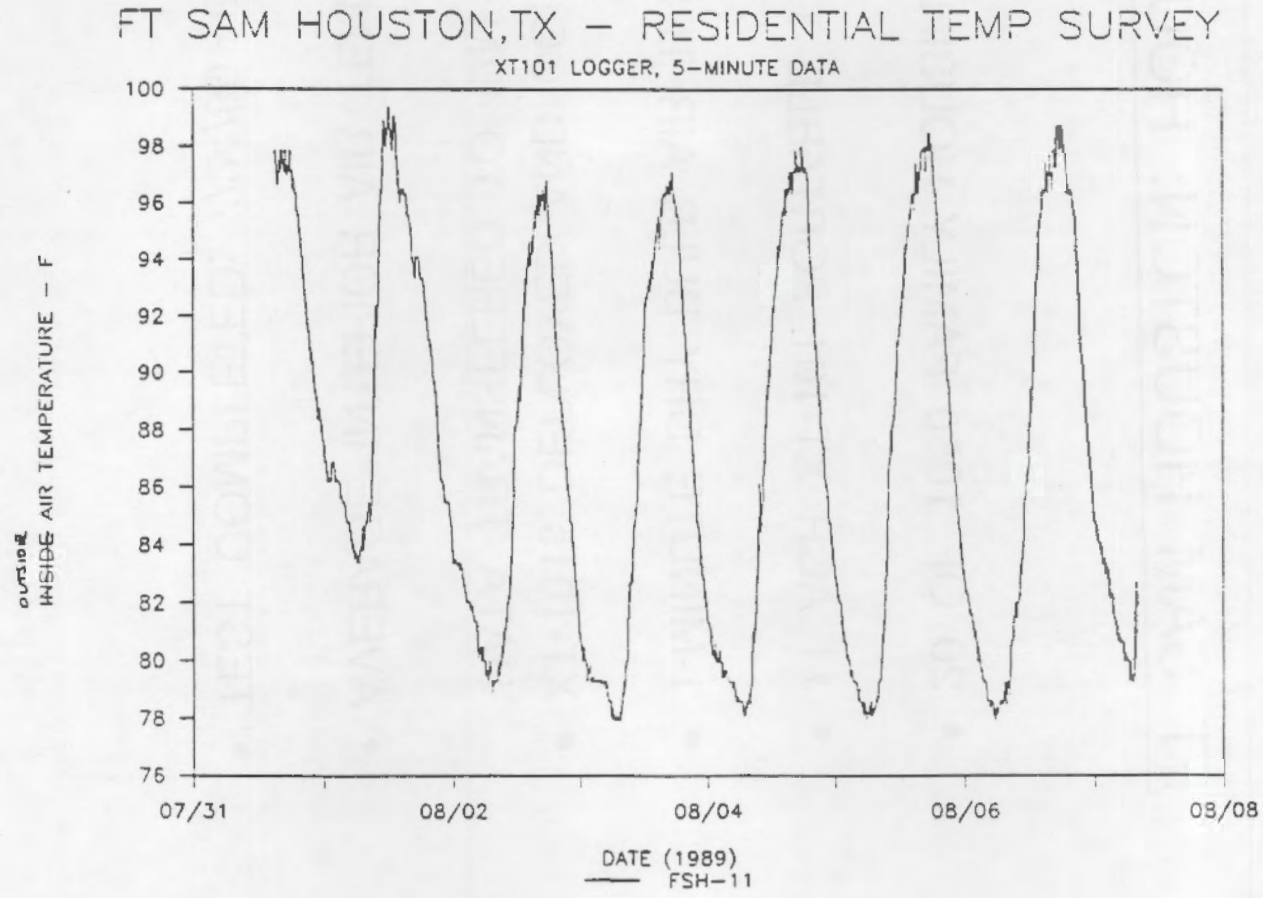
FORT SAM HOUSTON, TX - MAP

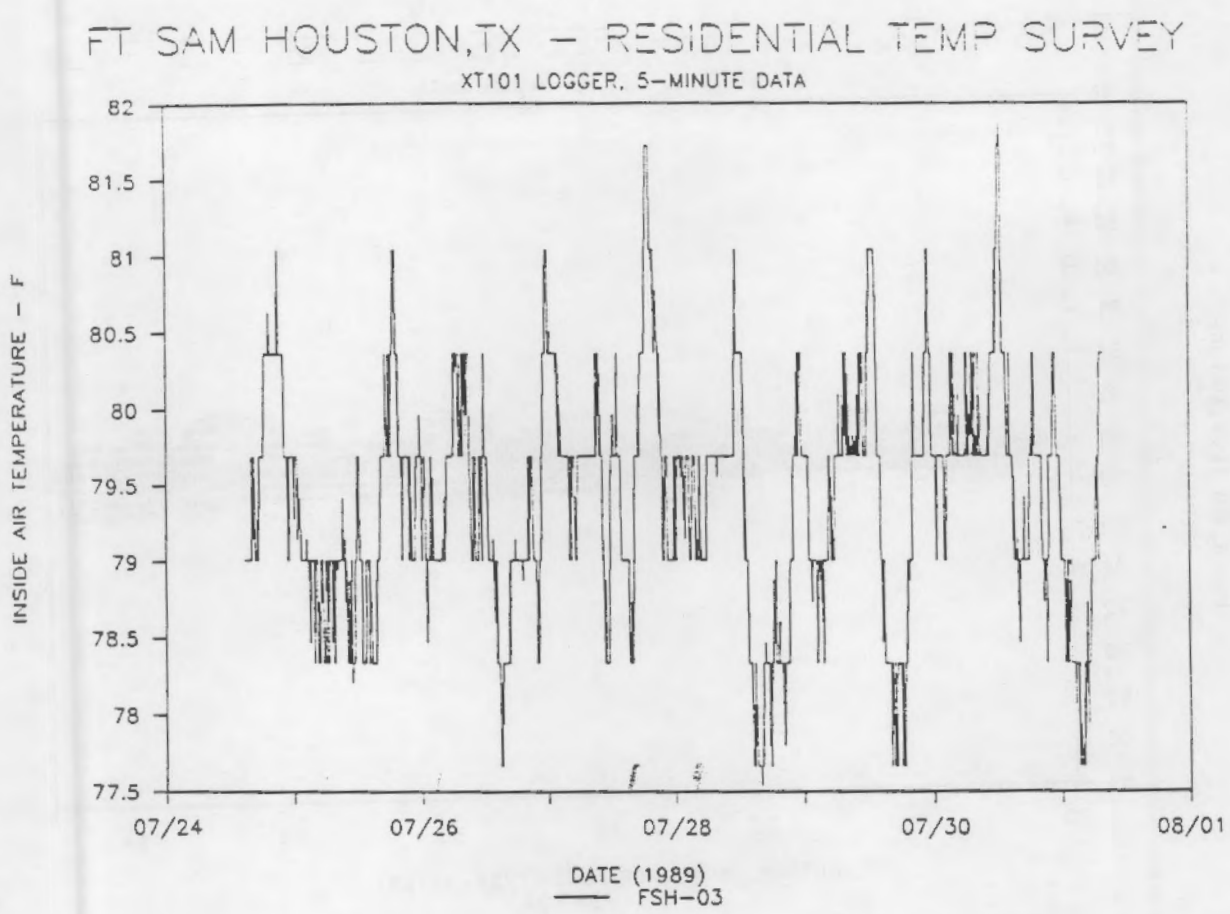
- FAMILY HOUSING INTERIOR AIR TEMPERATURE SURVEY
- CHILLER OPERATING EFFICIENCY SURVEY
- PUMPED DHW LOOP TEMPERATURE CONTROLLER EVALUATION
- LAUNDRY FACILITY BOILERS COMBUSTION EFFICIENCY

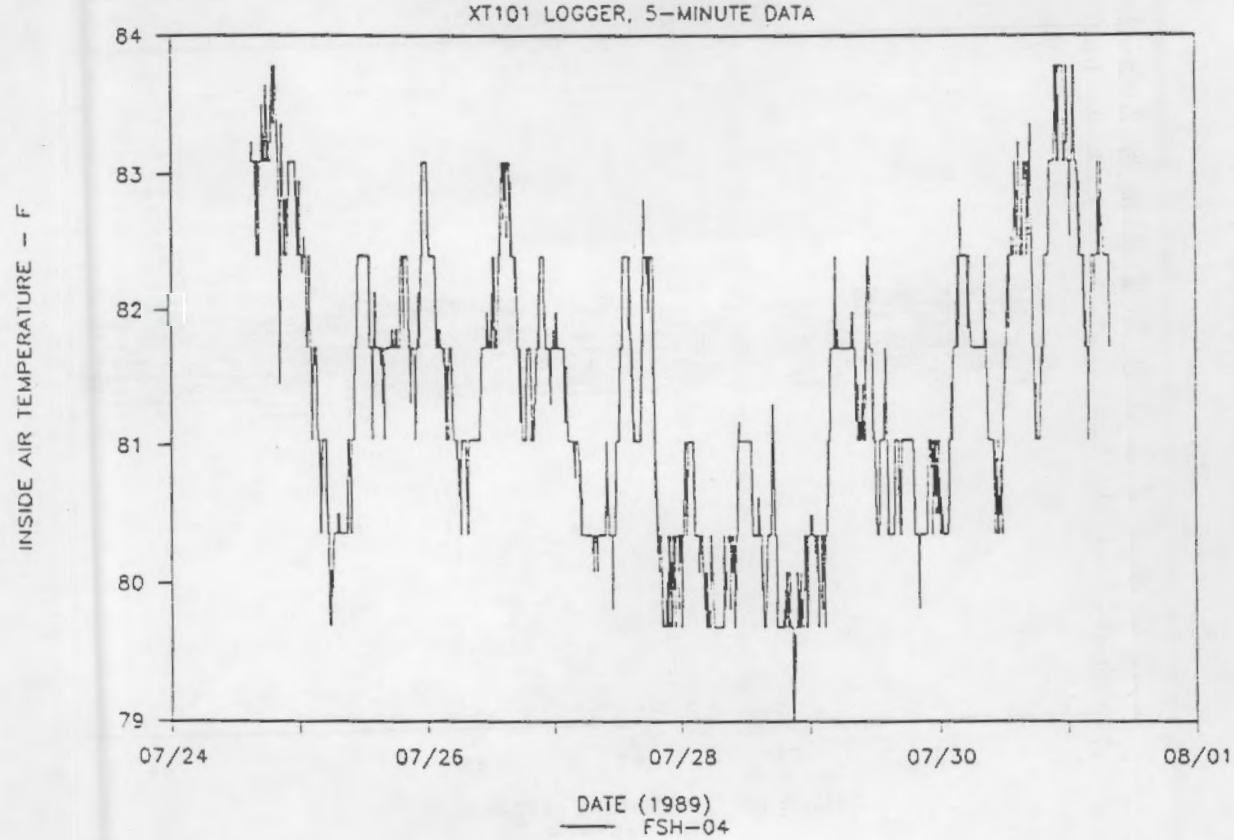
FT SAM HOUSTON: HOUSING TEMPERATURE SURVEY

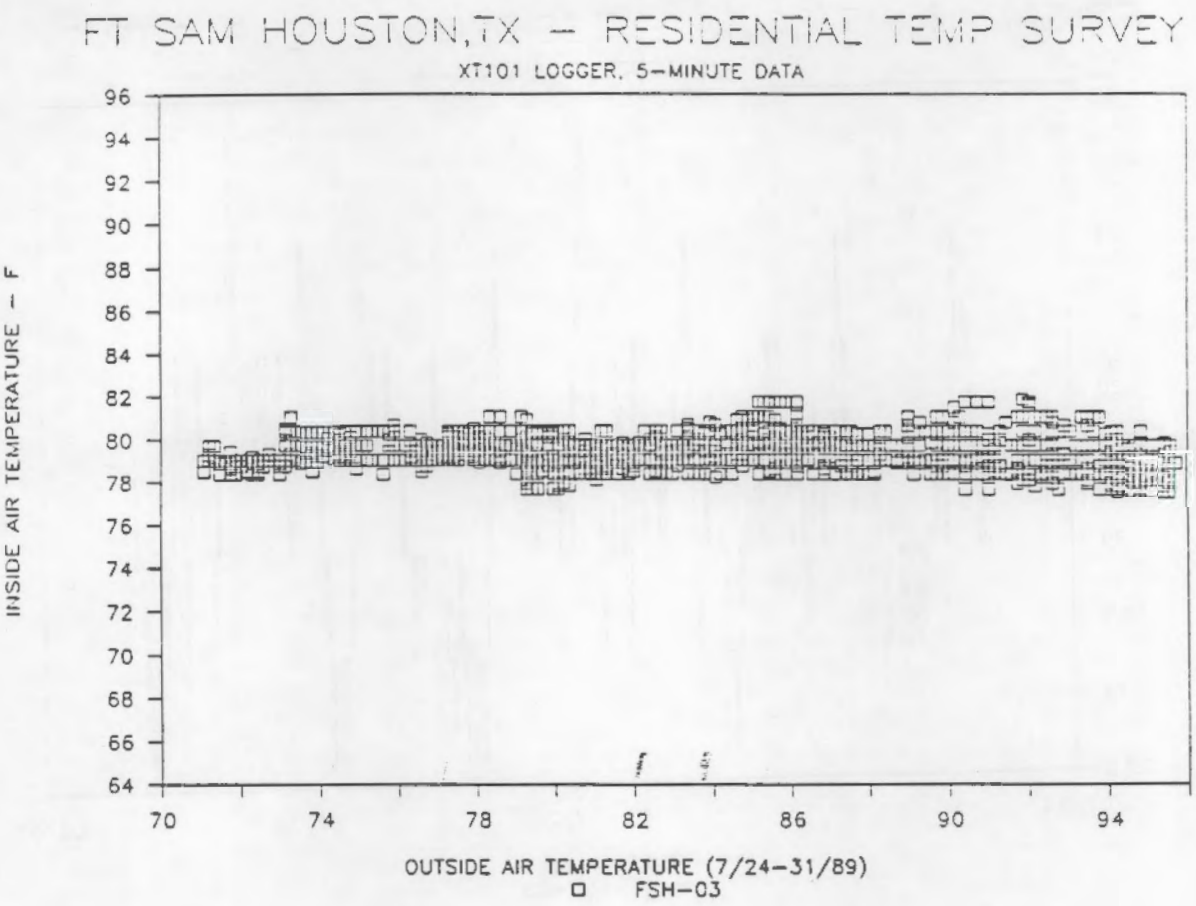
- 20 OF 1050 FAMILY HOUSING UNITS SURVEYED
- 11 ACR XT-101 PORTABLE TEMPERATURE RECORDERS
- 1-MINUTE DRY BULB AIR TEMPERATURE DATA FOR ONE WEEK
- XT-101s DEPLOYED AND COLLECTED BY DEH PERSONNEL
  DATA TRANSFERED TO IBM PC FORMAT BY PNL
- AVERAGE INTERIOR AIR TEMPERATURE = 78.8 F
- TEST COMPLETED: 7/24/89 - 8/7/89

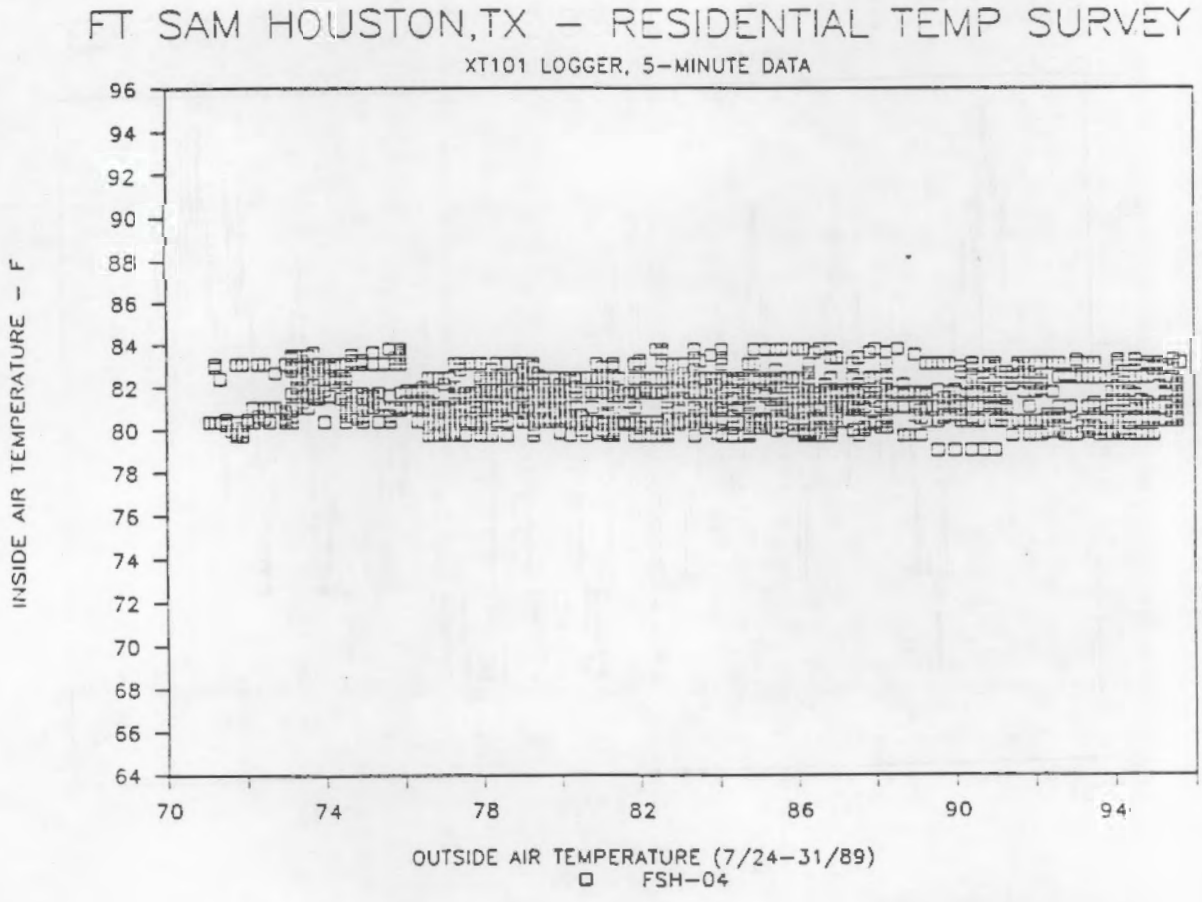

FT SAM HOUSTON,TX – RESIDENTIAL TEMP SURVEY
XT101 LOGGER, 5-MINUTE DATA
INSIDE AIR TEMPERATURE – F
96
94
92
90
88
86
84
82
80
78
76
74
72
70
07/24
07/26
07/28
07/30
08/01
DATE (1989)
FSH-11


FT SAM HOUSTON,TX – RESIDENTIAL TEMP SURVEY
XT101 LOGGER, 5-MINUTE DATA
INSIDE AIR TEMPERATURE – F
100
98
96
94
92
90
88
86
84
82
80
78
76
07/31
08/02
08/04
08/06
08/08
DATE (1989)
FSH-11


FT SAM HOUSTON,TX – RESIDENTIAL TEMP SURVEY
XT101 LOGGER, 5–MINUTE DATA
INSIDE AIR TEMPERATURE – F
82
81.5
81
80.5
80
79.5
79
78.5
78
77.5
07/24
07/26
07/28
07/30
08/01
DATE (1989)
FSH–03


FT SAM HOUSTON,TX – RESIDENTIAL TEMP SURVEY
XT101 LOGGER, 5–MINUTE DATA
INSIDE AIR TEMPERATURE – F
84
83
82
81
80
79
07/24
07/26
07/28
07/30
08/01
DATE (1989)
FSH–04


FT SAM HOUSTON,TX – RESIDENTIAL TEMP SURVEY
XT101 LOGGER, 5–MINUTE DATA
INSIDE AIR TEMPERATURE – F
96
94
92
90
88
86
84
82
80
78
76
74
72
70
68
66
64
70
74
78
82
86
90
94
OUTSIDE AIR TEMPERATURE (7/24–31/89)
FSH–03


FT SAM HOUSTON,TX – RESIDENTIAL TEMP SURVEY
XT101 LOGGER, 5–MINUTE DATA
INSIDE AIR TEMPERATURE – F
96
94
92
90
88
86
84
82
80
78
76
74
72
70
68
66
64
70
74
78
82
86
90
94
OUTSIDE AIR TEMPERATURE (7/24–31/89)
FSH–04

FT SAM HOUSTON: CHILLER EFFICIENCY SURVEY

- 21 MAJOR BUILDING CHILLERS LISTED BY DEH
- 5 SETS OF EMCO 3270 BTU METER, DRANETZ 808 POWER ANALYZERS, EACH WITH TECHTRAN RECORDERS
- 5-MINUTE DATA (FLOW RATE, TEMPERATURES, BTU, WATT, PF)
- PROCEDURE DEVELOPMENT CONDUCTED ON BATTELLE CHILLERS
- START TEST: SEP-OCT, 1988; COMPLETE: MAY-JUNE, 1989

FT SAM HOUSTON: DHW LOOP CONTROLLER

- EVALUATION UNIT DHW LOOP TEMPERATURE CONTROLLER
- 4 ACR XT-101 PORTABLE TEMPERATURE RECORDER
- 15-MINUTE DATA (LOOP TEMPERATURES, BOILER OPERATION)
- DATA COLLECTED DURING CHILLER EFFICIENCY TESTS
- TEST PERIOD: SEP-OCT, 1988

ATTACHMENT 5: MEL SUSPENSE SCHEDULE

MOBILE ENERGY LABORATORY SUSPENSE SCHEDULE — LAST UPDATE: 121589
FOR THE FEDERAL ENERGY MANAGEMENT PROGRAM — CONFIRMATION DATE: 121589

Note: Only dates prior to the confirmation date are firm.

USING AGENCY	SUSP. DATE	COMP. DATE	ITEM DESCRIPTION
DOE -RPM	81589	80789	ELECTRICAL SYSTEM EVALUATION BRIEF DRAFT
ARMY-RFS	83089	90689	ARMY MEL MAINTENANCE/INVENTORY
ARMY-DLH	91589	91589	FT IRWIN INITIAL SITE VISIT
ARMY-JCV	92089	92089	DA BRIEFING OF MEL ACTIVITY
ARMY-RFS	92289	92589	FT IRWIN MAP
ARMY-DLH	93089	90189	NEW BUILDING COMMISSIONING PART A & B DRAFT
ARMY-RFS	100689	100589	FT STEWART/HUNTER INITIAL SITE VISIT
ARMY-RFS	102089	102089	FT STEWART/HUNTER AIR FIELD MAP
DOE -RPM	101389	101589	DOE MEL MOVED TO WASHINGTON DC
ARMY-RPM	101589	101389	MEL BROCHURE-FINAL DRAFT
ARMY-RFS	102789	102589	FT MCPHERSON INITIAL SITE VISIT
ARMY-RFS	103089	103089	FT LEWIS SUMMER TESTS
ARMY-RFS	102889	102889	WEEC IN ATLANTA
ARMY-GBP	102889		MEETING WITH MR PLUNKETT/CDE IN ATLANTA
DOE -RPM	110189	110189	MEL USER COMMITTEE MEETING IN ATLANTA
DOE -RPM	110389	110689	DOE MEL EQUIPMENT SHIPPED TO PNL
ARMY-RFS	110389	111089	FT MCPHERSON MAP
ARMY-RFS	111089	103089	FT GILLEM INITIAL SITE VISIT
ARMY-RFS	111789	111089	FT GILLEM MAP
ARMY-JCV	112989	112989	ENERGY MANAGERS MEETING IN KNOXVILLE
DOE -RPM	113089		MEL USE PLAN REVISED
ARMY-RFS	010290		ARMY MEL MOVED TO FT. LEWIS
DOE -RPM	120589		MEL BROCHURE PRINTED AND DISTRIBUTED
ARMY-DLH	011590		CHILLER TESTING AT PNL & DRAFT PROCEDURE
ARMY-DLH	123089		WHOLE BUILDING TEST PROCEDURE DRAFT
ARMY-DLH	123089		HVAC SYSTEM TEST PROCEDURE DRAFT
DOE -RPM	013089		CHILLER EVALUATION CAPABILITY BRIEF
ARMY-RFS	010490		FT CARSON TESTS
USAF-DLH	010790		PETERSON AFB SITE VISIT/MAP
ARMY-RFS	031889		FT LEWIS TESTS
ARMY-RFS	032089		FT SAM HOUSTON WINTER TESTS
ARMY-RFS	040890		FT MCPHERSON TESTS
ARMY-RFS	040889		FT GILLEM TESTS
ARMY-RFS	061690		FT SAM HOUSTON SUMMER TESTS
ARMY-RFS	073090		FT IRWIN TESTS
ARMY-RFS	083090		FT STEWART TESTS
ARMY-RFS	083090		HUNTER ARMY AIR FIELD TESTS
NAVY-RFS	083090		NATIONAL NAVAL MEDICAL CENTER TESTS

MOBILE ENERGY LABORATORY SUSPENSE SCHEDULE — LAST UPDATE: 121589
FOR THE FEDERAL ENERGY MANAGEMENT PROGRAM — CONFIRMATION DATE: 121589
BREAKOUT BY ACTIVITY TYPE

Note: Only dates prior to the confirmation date are firm.

USING AGENCY	DATE	COMP. DATE	ITEM DESCRIPTION
MEL BUS/EQUIPMENT ACTIVITY:			
ARMY-RFS	04/24-08/30	090689	ARMY MEL MAINTENANCE/INVENTORY
DOE -RPM	10/11-10/13	101589	DOE MEL MOVED TO WASHINGTON DC
DOE -RPM	11/03	110689	DOE MEL EQUIPMENT SHIPPED TO PNL
ARMY-RFS	12/08-12/09	120989	EQUIPMENT SHIPPED TO FT IRWIN
ARMY-RFS	01/03-01/03		ARMY MEL MOVED TO FT. LEWIS
ON-SITE ACTIVITY:			
ARMY-RFS	07/05-10/30	103089	FT LEWIS SUMMER TESTS
ARMY-RFS	09/11-09/15	091589	FT IRWIN INITIAL SITE VISIT
ARMY-RFS	10/02-10/06	100589	FT STEWART/HUNTER AIR FIELD INITIAL VISIT
ARMY-RFS	10/23-10/27	102589	FT MCPHERSON INITIAL SITE VISIT
ARMY-RFS	11/06-11/10	103089	FT GILLEM INITIAL SITE VISIT
ARMY-RFS	12/04-12/06	120689	FT LEWIS SUMMER TEST EQUIPMENT REMOVED
ARMY-RFS	01/03-01/20		FT LEWIS WINTER TEST EQUIPMENT INSTALL
ARMY-RFS	01/03-03/18		FT LEWIS WINTER TESTS
USAF-DLH	01/05-01/07		PETERSON AFB SITE VISIT
ARMY-RFS	02/19-02/22		FT SAM HOUSTON WINTER TEST EQUIP INSTALL
ARMY-RFS	02/20-03/20		FT SAM HOUSTON WINTER TESTS
ARMY-RFS	11/27-12/01	121589	FT IRWIN TEST EQUIPMENT INSTALLATION
ARMY-RFS	12/15-07/30		FT IRWIN TESTS
ARMY-RFS	01/02-01/04		REMOVE TEST EQUIPMENT AT FT CARSON
NAVY-RFS	01/08-01/17		NNMC TEST EQUIPMENT INSTALLATION
NAVY-RFS	01/15-08/30		NNMC TESTS
ARMY-RFS	01/22-01/26		FT MCPHERSON TEST EQUIPMENT INSTALLATION
ARMY-RFS	01/24-04/08		FT MCPHERSON TESTS
ARMY-RFS	02/05-02/10		FT GILLEM TEST EQUIPMENT INSTALLATION
ARMY-RFS	02/08-04/08		FT GILLEM TESTS
ARMY-RFS	04/05-04/09		FT STEWART TEST EQUIPMENT INSTALLATION
ARMY-RFS	04/06-08/30		FT STEWART TESTS
ARMY-RFS	04/04-04/13		HUNTER AIR FIELD TEST EQUIPMENT INSTALL.
ARMY-RFS	04/05-08/30		HUNTER AIR FIELD TESTS
MAPS/REPORTS:			
ARMY-RFS	07/17-07/28	073189	FT SAM HOUSTON MAP
ARMY-GBP	09/18-09/22	092589	FT IRWIN MAP
ARMY-RFS	10/09-10/20	102089	FT STEWART/HUNTER AIR FIELD MAP
ARMY-RFS	10/30-11/03	111089	FT MCPHERSON MAP
ARMY-RFS	11/10-11/17	111089	FT GILLEM MAP
USAF-DLH	01/05-01/07		PETERSON AFB MAP
ARMY-GBP	01/07-01/10		FT CARSON TEST REPORTS
ARMY-GBP	12/18-12/22		FTLEWIS-002,-003,-005,-008 TEST REPORTS
ARMY-GBP	12/18-12/22		FSAMH-001 TEST REPORT

MOBILE ENERGY LABORATORY SUSPENSE SCHEDULE — LAST UPDATE: 121589
FOR THE FEDERAL ENERGY MANAGEMENT PROGRAM — CONFIRMATION DATE: 121589
BREAKOUT BY ACTIVITY TYPE

Note: Only dates prior to the confirmation date are firm.

USING AGENCY	DATE	COMP. DATE	ITEM DESCRIPTION
PROCEDURES:			
ARMY-DLH	093089	90189	NEW BUILDING COMMISSIONING PART A&B DRAFT
ARMY-DLH	011589		CHILLER TESTING PROCEDURE DRAFT
ARMY-DLH	123089		WHOLE BUILDING TEST PROCEDURE DRAFT
ARMY-DLH	123089		HVAC SYSTEM TESTING PROCEDURE DRAFT
OTHER:			
DOE -RPM	81589	080789	ELECTRICAL SYSTEM EVALUATION BRIEF DRAFT
ARMY-JCV	92089	092089	DA BRIEFING OF MEL ACTIVITY
DOE -RPM	101589	101389	MEL BROCHURE FINAL DRAFT
ARMY-GBP	10/27-10/28	102789	WEEC IN ATLANTA
ARMY-GBP	102889		MEETING WITH MR PLUNKETT/COE IN ATLANTA
DOE--RPM	10/31-11/01	110189	MEL USER COMMITTEE MEETING IN ATLANTA
ARMY-JCV	112089	112089	ENERGY MANAGERS MEETING IN KNOXVILLE
DOE -RPM	11/27-11/30		MEL USE PLAN AND CHARTER UPDATE PROPOSAL
DOE -RPM	121589		MEL USE COMMITTEE MINUTES DISTRIBUTED
DOE -RPM	12/01-12/15		MEL BROCHURE REVISED AND PRINTED
DOE -RPM	011590		MEL BROCHURE DISTRIBUTED
DOE -RPM	013090		CHILLER EVALUATION CAPABILITY BRIEF

ATTACHMENT 4

MEL ASSIGNMENT PLAN CURRENT STATUS

03/31/90

STATUS OF FORSCOM TEST REPORTS

MAP #	TEST REPORT TITLE	STATUS	
FORT CARSON	[Initial Site Visit 01/89]		
CARSON-001	Building 8030 Lighting and End Use Metering	Testing Started	03/89
CARSON-002	Combustion Efficiency/Waste Oil Burn	Testing Completed	03/89
CARSON-003	Building 8000 Compressor Evaluation	Testing Started	03/89
FORT LEWIS	[Initial Site Visit 05/89]		
LEWIS-001	Power Factor at Yakima Firing Range	Unsigned by DEH	
LEWIS-002	Electrical Distribution System Profile	Testing Completed	10/89
LEWIS-003	Sewage Treatment Plant Profile	Testing Completed	06/89
LEWIS-004	Lighting Levels in Buildings	Unsigned by DEH	
LEWIS-005	Commissary Electric Usage Profile	Testing Completed	10/89
LEWIS-006-R1	Steam & HTHW Boiler Testing	Testing to Start	01/91
LEWIS-007-R1	Barracks Heat Demand	Testing to Start	01/91
LEIWS-008	Helicopter Hanger Retrofit Evaluation	Unsigned by DEH	
LEWIS-009	Helicopter Simulation Building Tripout	To be Revised	
FORT SAM HOUSTON	[Initial Site Visit 08/89]		
FTSAM-001	Air Conditioner Controller Evaluation	Testing Completed	08/89
FSAMH-002	Chiller Performance Evaluation	Testing to Start	07/90
FSAMH-003	Hot Water Controller Evaluation	Testing to Start	07/90
FSAMH-004	Laundry Boiler Delivery Efficiency	Testing to Start	07/90
FORT IRWIN	[Initial Site Visit 09/89]		
IRWIN-001	Electrical Distribution System Profile	Testing Started	03/90
IRWIN-002	Office Building Electric Use Profile	Testing Started	01/90
IRWIN-003	Measured Lighting Levels in Four Office Buildings	Testing Completed	12/89
HUNTER ARMY AIR FIELD	[Initial Site Visit 10/89]		
HUNTR-001	Electrical Distribution System Profile	Instrumented	02/90
HUNTR-002	Chiller Performance Evaluation	Testing to Start	07/90
FORT STEWART	[Initial Site Visit 10/89]		
STWRT-001-R1	Electrical Distribution System Profile	Testing Started	02/90
STWRT-002-R1	Main Power Plant Electric Use Profile	Testing Started	02/90
FORT MCPHERSON	[Initial Site Visit 11/89]		
FTMAC-001	Boiler Combustion/Delivery Efficiency	Testing Started	02/90
FTMAC-002	Building 200 Electrical Profile	Testing Started	02/90
FTMAC-003	Combustion Efficiency Small Boilers	Testing Completed	02/90

FORT GILLEM [Initial Site Visit 11/89]

FTGIL-001	Warehouse Temperature Stratification	Testing Started	02/90
FTGIL-002	Boiler Shutdown Evaluation	Testing Resch.	02/90

ATTACHMENT 5

MEL ASSIGNMENT PLAN PREPARATION FORMAT

MEL APPLICATION PLAN

MEL ASSIGNMENT PLAN (MAP) - TEST IDENTIFICATION

Date: _____ Completed By: _____

Site: _____ Test No. _____

Test Objective:

Test Description:

Test Procedure(s):

Schedule Requirements:

Cost Estimate:

PNL personnel, equipment, and reporting: $
DEH support: - manhours

APPROVALS:

Richard Szydlowski MEL Technical Coordinator	Date	Graham Parker MEL Project Manager	Date
Site Contact	Date	Jim Vasiloff FORSCOM	Date

01/90

MEL ASSIGNMENT PLAN (MAP) - COST SUMMARY

Date: _____ Completed By: _____

Site: _____ Test No. _____

Manpower: Assume ____ weeks of taking data

Activity	DEH Support (manhours)	PNL Staff		
		Technician (manhours)	Engineer (manhours)	Manpower cost
Equip. Installation				$
Equip. Removal				$
Test Operation (mh/wk)				$
Analysis/Reporting				$

Supplies: $
(Note: Supplies are purchased and provided by PNL)

Equipment Usage/Calibration: $

Travel/Living: $

Activity	Installation	Removal	Total $
Travel labor	man-days	man-days	$
Air fare	$	$	$
Living	man-days	man-days	$
Car rental	days	days	$

Total Cost Estimate:

PNL personnel, equipment, and reporting: $
DEH support: - manhours

01/90

MEL APPLICATION PLAN

MEL ASSIGNMENT PLAN (MAP) - POST-TESTING SUMMARY

Date: _____ Completed By: _____

Site: _____ Test No. _____

Reports/Data: _____

Costs:	Manpower $	Supplies $	Travel/Living $	Total $
Estimated Cost:				
Actual Cost:				

Variance Explanation

Lessons Learned

Signed: _____ MEL Project Manager Date _____
Graham B. Parker

01/90

ATTACHMENT 6

MEL TEST REPORT FORMAT

TEST REPORT FOR

[SITE NAME]

[TEST TITLE]

PREPARED BY PACIFIC NORTHWEST LABORATORY

FEOERAL ENERGY MANAGEMENT PROGRAM

PREPARED FOR THE UNITED STATES ARMY

HEADQUARTERS FORCES COMMAND

PREPARED BY:_____ DATE:_____
Ph#

APPROVED BY:_____ DATE:_____
Graham B. Parker Ph# (509) 375-3805

Prepared for the U.S. Army Forces Command under a Related Services Agreement with the U.S. Department of Energy Federal Energy Management Program Contract DE-AC06-76RL0 1830

Report No. [MAP#-yr/mm/da]

EXECUTIVE SUMMARY

Site Test Report Number for period___(date)___ to ___(date)___.

PURPOSE This test was conducted under the Mobile Energy Laboratory (MEL) Assignment Plan (MAP) [insert MAP # here]. The purpose of this test was to ... [1 or 2 sentences].

RESULTS: [1-2 paragraphs]

RECOMMENDATIONS:

Based upon the findings and other information presented in the report, the following recommendations are made.

1.
2.
3. etc.

ENERGY USAGE IMPACT: [1-2 paragraphs giving economic analysis if appropriate]

[Note: The Executive Summary pages should stand alone, therefore the numbers should be roman starting with ii.]

[The following are the contents of the main body of the test report]

1.0 PURPOSE OF THE TEST

This test was conducted under the Mobile Energy Laboratorys (MEL)[1] Assignment Plan (MAP) [insert MAP# here] (see Appendices A and B). The purpose of this test was ..... continue.
This section describes the reason(s) that the test(s) were conducted and the decision making process leading up to the selection of this particular test. This section is very brief. Note in this section that "Appedix A contains the MEL Assignment Plan (MAP) which documents the testing as approved prior to performing the test. Appendix B contains the MEL Assignment Plan - Post Testing Summary which is a comparison of the estimated and actual test costs, and a summary of problems encountered and lessons learned."

2.0 TEST DESCRIPTION AND PROCEDURES

This section describes the test in some detail including the test procedures that were followed, referencing the MEL Test Procedures if appropriate, as well as the dates of the testing.

3.0 TEST APARATUS AND INSTRUMENTATION

The apparatus and instrumentation used in the conduct of the test are listed. Instrumentation must include model numbers and serial numbers listed in a column with bullets--use minimal text.

4.0 TEST DIAGRAM

This section describes or illustrates the test set-up. This includes either a diagram or photocopy of photographs taken at the test site. Each important item in the test set-up will be labled and instrument ID#s will be included.

5.0 DEFINITION DF TERMS

The terms used in the report are defined in this section in alphabetical order.

6.0 RESULTS

This section summarizes the key results and relies on data that are reduced and presented in its most useful form. Graphs are included that will add to the understanding of the data. The raw or summarized data will be placed in Appendices beginning with Appendix C.

---

[1]The MEL is operated by Pacific Northwest Laboratory (PNL) for the U.S. Department of Energy Federal Energy Management Program under contract with FORSCOM.

7.0 ECONOMIC ANALYSIS

This section contains a preliminary life-cycle cost analysis using standard program developed by DOE to ascertain the benefits or payback of each of the recommendations listed below. It is intended to provide sufficient information to support the prioritization of the action items and allow a site to determine resource expenditures on efficiency programs.

8.0 RECOMMENDATIONS AND CONCLUSIONS

This section provides a preliminary prioritization of action items and recommendations to improve energy use effectiveness. We may recommend further data collection and analysis to confirm these preliminary observations prior to substantial investments at the site.

APPENDICES

[Note: The Appendices pages are not numbered]

APPENDIX A: MEL ASSIGNMENT PLAN (MAP)

This appendix is a copy of the MAP as prepared and signed-off.

APPENDIX B: MEL ASSIGNMENT PLAN (MAP) - POST-TESTING SUMMARY

This appendix is a copy of the MAP Post-Testing Summary that includes the costs and cost variance and lessons learned. The Post-Testing Summary is signed off before transmittal to SAS.

APPENDIX C --->n: RAW AND SUMMARIZED DATA

This appendix includes raw data collected and data summaries not included in the main report that may be useful for more detailed analysis. However, figures should go in the main body of the report.

These Appendices should also include rate schedules, data logger configuration, etc.

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